



FRIDAY, DEC. 15, 1893.

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The Canvass for the Secretaryship—Am. Soc. C. E.

NEW YORK, Dec. 7, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I respectfully request you to give prominence to the following personal explanation. I decided at the outset not to oppose the action of the Nominating Committee in placing me in nomination for the Vice-Presidency of the American Society of Civil Engineers. Since that time I have been formally nominated as Secretary by about 70 Members, in various parts of the country, and this, together with the most urgent solicitations of many friends, has led me to accept the renomination to that office, which I did on the 5th inst.

The Board of Directors has decided that the constitution requires the official ballot to contain my name as a candidate for both the offices mentioned. I wish, therefore, to state in most positive terms that I am not now a candidate for the Vice-Presidency; and, under the circumstances, should I be elected to that office I would feel it my duty to decline it.

It is my particular request that my friends shall refrain from unfavorable criticism of the opposing candidate for the secretaryship, and that the contest shall be decided on the broad grounds of policy.

F. COLLINGWOOD.

Narrow Gauge in the Andes.

Rialto Building,  
CHICAGO, Dec. 8, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the article on the Antofagasta & Bolivia Railroad, published in your issue of the 1st inst., you remark that the railroad mentioned is a "model of wise practice for the promoters of other pioneer lines in the Andean region of South America, except in the matter of gage, which is 30 in."

It has always seemed to me that if there is any place in the world where a narrow gage is defensible it is in the Andes. The country is, in the main, a waste of high ranges of mountains, bewildering in their size and grandeur, and much cut up by ravines and deep canyons. It is in great part devoid of vegetation, except for the growth that starts up in the rainy season, affording some pasturage for cattle and sheep. There are but few habitable valleys of great extent, and, taking the region as a whole, the area which can be devoted to cultivation of crops is exceedingly small. In southern Peru and in Bolivia there are extensive elevated tablelands, *pampas*, on the eastern slopes, which stretch away eastwardly and southwardly, reaching the confines of Brazil, Paraguay and the Argentine Republic. These tablelands are surrounded by mountainous regions, which separate them one from another.

In such a country railroad traffic must always be limited and of far less diversified character than in this country. The movement of traffic is substantially on parallels of latitude, and will be so, in all probability, for generations. Railroads will continue to be built to serve certain mineral regions or valleys, which are to all intents and purposes *culs de sac*, whose approach from the west coast will be accompanied by the most serious difficulties of mountain location and construction. For such conditions the narrow gage has always some attractive features and often presents the only solution.

The prime object is railroad communication with the st coast. There is but little tendency toward, o

necessity for, a connection between lines so as to form a general system, although, doubtless, this will come, to a limited extent, in the course of time.

There are lines on the west coast, like that from Valparaiso to Santiago or others, extending into coast valleys, like that from Salaverry to the Chirna Valley, which presented no serious construction problems and where no objection could be urged to the use of a standard gage. There is also the great Ferro Carril Central (Oroya Railroad) of Peru, intended to ultimately reach navigable water on the Rio Ucayli, which, perhaps, was wisely made a standard gage. But, taking the Andean region as a whole, it may be stated, as a general proposition, that the narrow gage affords the best means, commercially and practically, of railroad development.

Take, for instance, the line from Mollendo to Arequipa and thence to Puno, on Lake Titicaca (Southern Railway of Peru), which was built as standard gage at vast expense. What possible object has been accomplished, or ever will be, by using the standard in place of the narrow gage? How much better it would have been to use a narrow gage and have had means left on reaching Puno to extend the line to Cuzco, in Peru, on the north, and to La Paz, the capital of Bolivia, and also along the Desaguadero to Oruru.

The Huanchaca of Bolivia company was doubtless right in building its line from Antofagasta to Huanchaca. But nearly 20 years have elapsed since the standard gage reached Puno from Mollendo, during which time, if the construction of this line had not been so expensive, some of the means would have remained, and combinations might have been formed, which would have given central Bolivia a very considerable railroad development.

The Antofagasta & Bolivia line is fairly successful as a narrow gage. As a standard gage, if practicable at all, it would have been a commercial failure owing to its great first cost.

There are but few localities in our own country where a narrow gage can be defended, especially owing to the rapid extension, connection and consolidation of lines requiring a uniform gage of rolling stock. In the Andes, and I think I may say in many parts of South America, the conditions are so wholly different that the use of the narrow gage is imperative.

In 1870, the Peruvian government gave Mr. Henry Meiggs, the railroad contractor, a concession calling for a survey from Tacna across the Andes to the Bolivian frontier toward Oruru and La Paz. It was my fortune to have charge of the half of this survey beginning at a point part way down the western slope of the Andes and extending to the Bolivian frontier. The pass was a good one and the line east of the summit of the Andes was a fairly easy one to build, but on the Western slope great difficulties were found, so that, having already begun the construction of the line from Arequipa to Puno, which could be extended, as I have described, the project was abandoned.

The extensions from Puno, however, were not made, and meantime the Huanchaca company, working on sensible principles and with a practicable gage, has extended its line up the Rio Loa and is in position to give central Bolivia all the railroad facilities it really requires. In desert or mountain countries the narrow gage will often thrive and progress where a standard gage would be dead as an investment.

VIRGIL G. BOGUE.

Burnt Clay Ballast.

Burnt clay has been used for ballast in England for more than 20 years, in the United States for at least 12 years, and in India for an unknown period, and more or less in various other countries; yet there seems to be considerable ignorance as to its preparation and uses. It may be well, therefore, to sum up what we have said on this subject within the last few years, particularly in the year 1889, and add such new information as is conveniently available. This we endeavor to do in what follows.

In the United States almost the only experience with it has been in the West. The material which has been found most suitable is good brick clay, or the black, greasy looking clay coming just below the line of the top soil, the texture being nearly that which is sometimes termed "gumbo." The deeper soil or clay does not always seem to burn so well, and the upper soil contains too much carbonaceous matter. The quality of clay that makes good paving brick will make the best ballast material. The burnt product should be of a dark, brick-red or purplish color. Anything which shows yellowish or very light red after burning is, as a rule, not desirable, crumbling from use and the effects of the weather. Experience with working the clay in local brickyards, or experiments made upon a small scale, will readily determine whether any soil will fill the necessary conditions. The top soil containing vegetation is scraped off, and the clay underneath, suitable for ballast is also removed to a greater or less depth, according to its thickness, and placed on one side to be burnt in due time. The surface of the ground thus cleaned forms a bed upon which to commence operations. A track is laid to run cars of coal alongside the piles for burning.

A row of cordwood, old ties or other kindling material is built on the ground about 4 ft. wide and 3 ft. high, and 500 to 4,000 ft. long, depending upon the length of the average ballast trains to be loaded; the ground controlled and the quantity to be burnt. Slack coal or

lack and lump mixed is sprinkled through the pile and over it to a depth of 2 or 3 in. Over this again is spread about a foot of the earth to be burned, and the pile is ignited at suitable distances, the openings being closed when the fire is well started, or the pile may be lighted at one end when partly built, and building and burning may be going on at the same time. After the mass is well on fire, a layer of from 6 to 8 in. of coal slack is spread upon the heap, and over this again a foot of the clay. This is repeated; the later layers of clay being deeper in proportion to the coal, as the heat remaining in the pile helps to burn the new clay. As the fuel at the bottom burns, the pile gradually sinks and the layering process is continued until the finished heap is perhaps 20 ft. wide and 10 ft. high. When it cools the material is ready for use, rejecting, of course, any ashes remaining from the fuel used in preparation. One ton of slack will burn from 4 to 5 cu. yds. of clay.

The burnt clay breaks, when handled, into irregular pieces, which are again broken on the track into pieces of the desired size, so that the largest will go through a 3-in. ring. Burnt ballast thus prepared works under the ties well, can be dressed up to line beyond the ends of the ties, and keeps a well-trained track. The small amount of dirt which comes from tamping is washed into the body of the ballast by the first rains, so the result is a minimum of discomfort to travelers, or of trouble from not boxes on cars and engines, on account of dust. Being well drained, the ties are kept dry and do not decay rapidly. The cost of good burnt ballast, loaded on flat cars, runs from 35 to 85 cents a cubic yard, depending on the price paid for labor and for fuel used. Fifty cents a yard may be considered a fair average price.

This class of ballast has been used in the West to a greater or less degree on the lines of various railroads in Illinois, Iowa, Missouri and Nebraska, in prairie sections where other ballasting is scarce. Among the roads following this particular practice are the Chicago, Milwaukee & St. Paul; Chicago, Burlington & Quincy; Burlington & Missouri River Railroad in Nebraska; Chicago, Rock Island & Pacific, Hannibal & St. Joseph; and the Wabash, and the results on all are satisfactory. One road reports in track, at the end of 1892, 135 miles of burnt ballast.

The demand for this class of ballast has increased so that there are now several companies in the field making a specialty of contracting for burning and delivering a supply, where the roads decide not to do the work entirely themselves, the arrangement made varying according to the proportion of fuel, material and labor furnished by the railroad in each case.

In some cases, automatic arrangements are used to plow up the clay and deliver it by conveyors on the top of the pile. This has the disadvantage of delivering it often in a condition too finely divided. A machine on the principle of a dredge, which is also used for this purpose, by which it is handled more in lumps, seems to turn out a better finished product.

It is interesting to note that, in the so-called "Bad Lands" of Wyoming and Montana, places are found where the burning out of underground coal veins has reduced the layers of earth and clay overlying them to a burnt condition, resulting in nearly the same material as the artificially burned ballast. This fact has been taken advantage of locally with good results for railroad ballast.

On Certain New Work in and about St. Louis.

*The Burlington's New Entrance Into St. Louis.*—The Bellefontaine Bridge, which is now near completion, is a link in a very important enterprise. When it is finished the large expenditure by the Chicago, Burlington & Quincy in building the extensive terminals in St. Louis and the new line into that city from the north will become available.

All the new work, which is to give the Burlington company its new entrance to St. Louis and terminals there, has been carried on by the St. Louis, Keokuk & Northwestern, the entire capital stock of which is owned by the former company. The extension will also serve the Missouri, Kansas & Texas for its entrance to St. Louis, that company having secured trackage rights over the new railroad and bridge for a long term of years. The sketch map shows where the new branch diverges from the old line of the St. Louis, Keokuk & Northwestern, in St. Charles County, near Old Monroe, about nine miles northwest of St. Peter's, the terminus of the road. It shows also where the Missouri, Kansas & Texas, or more strictly the Missouri, Kansas & Eastern, joins the new road about 11 miles northeast of St. Charles.

Heretofore the Burlington lines west of the Mississippi River have entered St. Louis over 40 miles of the Wabash from St. Peter's, crossing the Missouri River on the St. Charles Bridge, under a contract made in 1888, and trains now run into St. Louis over this route. The C., B. & Q. is now constructing very fine freight terminal stations and yards in St. Louis, on the north side of the city, and these, with the new extension built by the St. Louis, Keokuk & Northwestern, will give it and the Missouri, Kansas & Texas ample and economical accommodations. The whole enterprise, railroad, bridge, yards and stations, is being carried out under Mr. George S. Morison, as Chief Engineer, and from his designs, Mr. B. L. Crosby being Resident Engineer of the whole work.

*New Stations and Yards.*—Beginning at the St. Louis,



end, the first of the stations is the Franklin avenue freight station.

The total length of the station building, including the office building, is 809 ft. and platform 76 ft., the length of the trainshed is 771 ft. with a platform outside running north 76 ft. On the west side of the trainshed, under the roof, is a receiving platform 760 ft. long and 32½ ft. wide, and on the outside is a platform 76 ft. long and 32½ ft. wide. On the east side is a platform under roof for delivering freight, 760 ft. long and 42½ ft. wide, and it is continued outside of the roof 76 ft. long and 42½ ft. wide. There are 36 doors on each side, 9 ft. high and 20 ft. wide. In the house are five tracks each 750 ft. long, giving a total length of 3,750 ft., or a capacity for, say, 100 cars. Outside of the shed is a small yard with further track capacity for 50 cars. The cross-section of the trainhouse and platforms shows an incline from the street on the receiving side to the street on the delivery side, the receiving platform being inclined toward the cars, each track being on a somewhat lower level than the adjacent one and the delivery platform sloping toward the street. Thus, in delivering or receiving freight the work is done by the men in the direction of the down grade. Of course to get at the inside tracks, freight must be handled through the cars. These tracks are all spaced 11 ft. centers.

The office building is an excellent specimen of design and construction, being substantially built throughout, fireproof or of modern slow-burning construction, and contains eight large office rooms with vaults and all other conveniences.

About half a mile north of this the company has a tract of 15 acres on which a passenger station is building and where a freight yard is being constructed. The yard is 2,000 ft. long and 320 ft. wide. This is principally intended as a team track yard, for the receipt and delivery of freight by trucks. The tracks are arranged in pairs with paved wagon roads between each of the pairs of tracks. The yard is below the level of Second street, which forms its western boundary, and street traffic is carried over it by a bridge of 293 ft. span. There is no street crossing at grade. Here also is a convenient passenger station which can be reached from Broadway through a covered way.

About three miles farther north is the North St. Louis yard. This is the great sorting and classification yard. It is of great capacity, the railroad owning more than 500 acres of land. It is on ground subject to overflow and will be protected by a dyke, and a troublesome creek will be diverted into a large brick drain 30 ft. span and 600 ft. long, which crosses the yard. The yard will be arranged to do much of the switching by gravity.

From this yard the new railroad runs out northward, crosses the Missouri by the Bellefontaine Bridge and thence runs westward to the junction with the old portion of the St. Louis, Keokuk & Northwestern, as shown on the sketch map. The total length of the railroad is about 47 miles, from St. Louis to Texas Junction. It is double track and is a very sound piece of work. There is one brick arch of peculiar shape under an embankment 50 ft. high. The arch is struck with a radius of 20 ft., but the opening is really less than 30 ft. wide. One side is a full centered arch; on the other side a natural limestone bluff is used as an abutment, thus shortening the width of the span.

South of the Missouri River the country, although at first sight appearing easy, is really very difficult. It is full of pot holes, often of considerable depth, with no outlet. There was no such thing as following the general direction of the drainage, for there is no general direction; and consequently the location was troublesome. To get a good profile involved considerable earthwork and a rather crooked line. The maximum grade is .5 per cent., and the sharpest curve 3 degrees.

**The Bellefontaine Bridge.**—The Missouri is crossed by the Bellefontaine Bridge. This is a double track structure, and, beginning at the south end, consists of four river spans each 440 ft. long, a viaduct 850 ft. long, and 2,900 ft. of wooden trestle, which will be filled. The south bank is so bluff that a short bank carries the track to the south river span.

There are four piers in the river on pneumatic caissons. The deepest was sunk 101.87 ft. below standard low water. Three of the caissons are 30 ft. x 70 ft., and one 24 ft. x 60 ft., and the caissons and cribs are of varying length from cutting edge to the masonry. These piers and the abutment on the south end are of Bedford limestone faced, between high and low water, with St. Cloud granite. They are beautiful specimens of masonry.

The viaduct is on 27 pairs of brick piers which support steel towers, the construction of which will be seen from the engraving herewith. There are in all 28 spans and the girders are 30 ft. 4 in. long. The posts are spaced 28 ft. 6 in. and 32 ft. 2 in., as shown in the side elevation of a portion of the viaduct at one of the posts (fig. 2). Thus, each alternate girder is suspended by the overhang of the adjoining girders, as shown. The joint is shown in fig. 2, but the provision for longitudinal motion will be better understood by reference to fig. 3. A steel roller, or pin, 5 in. diameter and 1½ in. long (or thick) is introduced and held in place by the outer plates. This pin is, however, split on its horizontal diameter, and slotted to take a phosphor-bronze key. These half-pins and key are shown in side elevation and section in fig. 3. The slot being 4¼ in., and the key 3¼ in., there

is ½ in. play longitudinally, while the pins allow for deflection of the girders. The whole arrangement is very mechanical. The other constructive features of the viaduct appear in the engraving.

The bridge proper consists of four spans of 440 ft. each, as we have said; the trusses being 55 ft. deep and 30 ft. apart between centers. The entire superstructure is of steel, all the work being reamed. It was manufactured by the New Jersey Steel & Iron Company at Trenton, N. J. These four spans are erected by Mr. William Baird of Pittsburgh. Each span weighs about 1,400 tons.

The viaduct on the north side, which weighs about 900 tons, was manufactured by A. & P. Roberts & Co. at Pencoyd, Pa., their contract also including erection.

The foundations were all put in by days' work under the direction of the Resident Engineer, Mr. B. L. Crosby. The masonry was built by Messrs. Christie & Lowe, Mr. George A. Lederle being the resident partner in charge of the work.

It is expected that the bridge will be open for traffic by the end of the year.

**The Alton Bridge.**—About four miles northeast from the Bellefontaine Bridge, Mr. Morison is building a bridge over the Mississippi at Alton. This enterprise is entirely distinct from the St. Louis, Keokuk & Northwestern, but will be worked in connection with it. The scope of the project will be explained later. The Alton bridge is a double track structure consisting of six fixed spans of 210 ft. each, one of 380 ft. and a draw span 450 ft. long. This draw span will be one of the heaviest in America.

The piers of the Alton Bridge, like those of other

that much traffic destined for points beyond St. Louis would be diverted to the belt line and so delivered to the St. Louis, Keokuk & Northwestern (C., B. & Q.) and to the Missouri, Kansas & Texas. Similarly, freight eastbound over those lines for any Eastern connection could be kept out of the city.

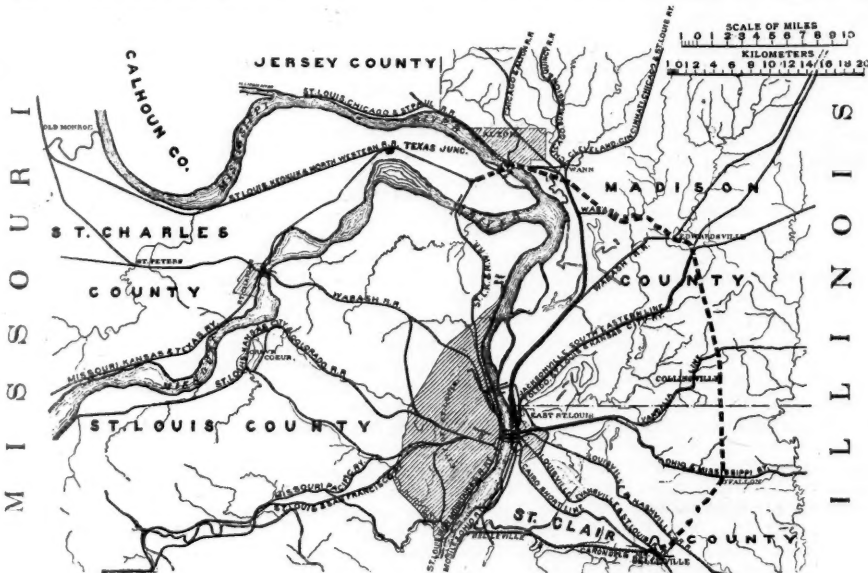
Third, this belt line runs through good coal lands and might be expected to develop an important coal business for distribution northwest and southwest of St. Louis.

The officers of the St. Clair, Madison & St. Louis Belt Railroad are: E. F. Leonard, President; J. G. Chandler, Secretary; C. Hodgman, Treasurer; George S. Morison, Chief Engineer.

#### The Chicago Elevated Loop Railroads.

That Chicago will have a loop of elevated railroad through or around its most crowded business center and connecting the various elevated and surface road stations is probable; and if one is to judge from the number of companies being organized to build it and the number of parties canvassing the field, there will either be several elevated structures or there will soon be a wild scramble to see which company shall be first to build. We have already mentioned the plan for an elevated structure to encircle the business center and to run conveniently near railroad stations already built and to those the location of which is quite definitely fixed. On this road it is proposed that electric motors hauling trains of ordinary coaches shall be used.

The latest proposition which has come to light, but which has been under consideration for some months,



Vicinity of St. Louis Showing New Railroads and Bridges.

Dotted line shows the proposed St. Clair, Madison & St. Louis Belt Railroad.

bridges on the upper Mississippi, have pile foundations. The masonry is built of oolitic limestone. Mr. Lewis M. Loss is contractor for the entire substructure. The superstructure is manufactured and erected by the Union Bridge Company. Mr. W. S. Macdonald has been the Resident Engineer of the work from the beginning. This bridge will probably be open for traffic in January, 1894.

The Alton Bridge is connected with the St. Louis, Keokuk & Northwestern by a piece of track now built and shown on the map in dotted line. This will serve to connect the Chicago, Burlington & Quincy and other roads, reaching Alton from the north and east, with the new entrance of the C., B. & Q. into St. Louis. It is also destined to be a link in another project, to be described presently. It is a very striking fact that these two bridges should be building simultaneously over the Mississippi and the Missouri within less than four miles of each other, one three miles and the other five miles from the confluence of those two great streams. And it is also interesting to note that the engineer of these two bridges is at this moment building another bridge over the Missouri at Leavenworth.

**The St. Clair, Madison & St. Louis Belt Railroad.**—This is a railroad projected from Belleville, Ill., northerly through St. Clair and Madison counties, thence westward to Alton and so over the Alton bridge to the junction with the St. Louis, Keokuk & Northwestern. The company organized to build this road is building the Alton bridge and has built the connecting track to the junction. Surveys have been made, but the precise route has not been located, nor indeed is it certain that an entirely new line as shown in dotted line on the map will be built. Some links of existing lines may be used. The probable sources of revenue for such a railroad are:

First, the connection which the Alton bridge gives for the roads coming in from the north with the C., B. & Q. terminals in St. Louis. This connection may also be used by other roads than the C., B. & Q.

Second, this belt line intersects all the railroads reaching St. Louis from the East. It seems probable

is for a system of loops for elevated moving sidewalk. The Central Construction Company, which was organized to build these loops, elected recently the following board of directors: Owen F. Aldis, Charles N. Fay, Bernard A. Eckhart, Harvey B. Hurd, William E. Hale, E. S. Pike and Charles H. Morse. The officers of the company are to be elected in a few days. Mr. George M. Pullman is financially interested in the company. Nothing concerning the plans of the company could be learned from the officers or from those interested in the undertaking, but from one who is in a position to know it is learned that the present plans are as follows: There are to be five loops in different parts of the business portion. Each loop will, at places on its line, run conveniently near two other loops, so that transfer from one to another will be quickly and easily made. At such points it will be necessary to just cross the street to make the transfer, the crossing to be made on a passageway at the same elevation as the moving sidewalk. The loops will vary in length from about 3,000 ft. to about 8,000 ft. The longest loop will be the one running north on Fifth avenue from Van Buren street to South Water street, west and southwest to Market street, south on Market street to Van Buren and thence to Fifth avenue. The next longest will be the one running south on State street from South Water street to Van Buren street, west on Van Buren to Wabash avenue, and north on Wabash avenue to South Water street and thence to State. The shortest will run east and west on Randolph and Lake streets respectively completing the loop on State street and Fifth avenue; it will connect the two loops described above. Another will encircle the square bounded by Van Buren street, Fifth avenue, Polk and State streets. The fifth will run east and west on Monroe and Madison streets respectively, completing the loop on State and Market streets. This loop crosses the one described above as the longest loop, in four places; these crossings will be made by elevating one line about 8 ft. above the other. Many routes have been considered, but those described above seem the most desirable and unless objecting property holders make changes necessary they will be followed.

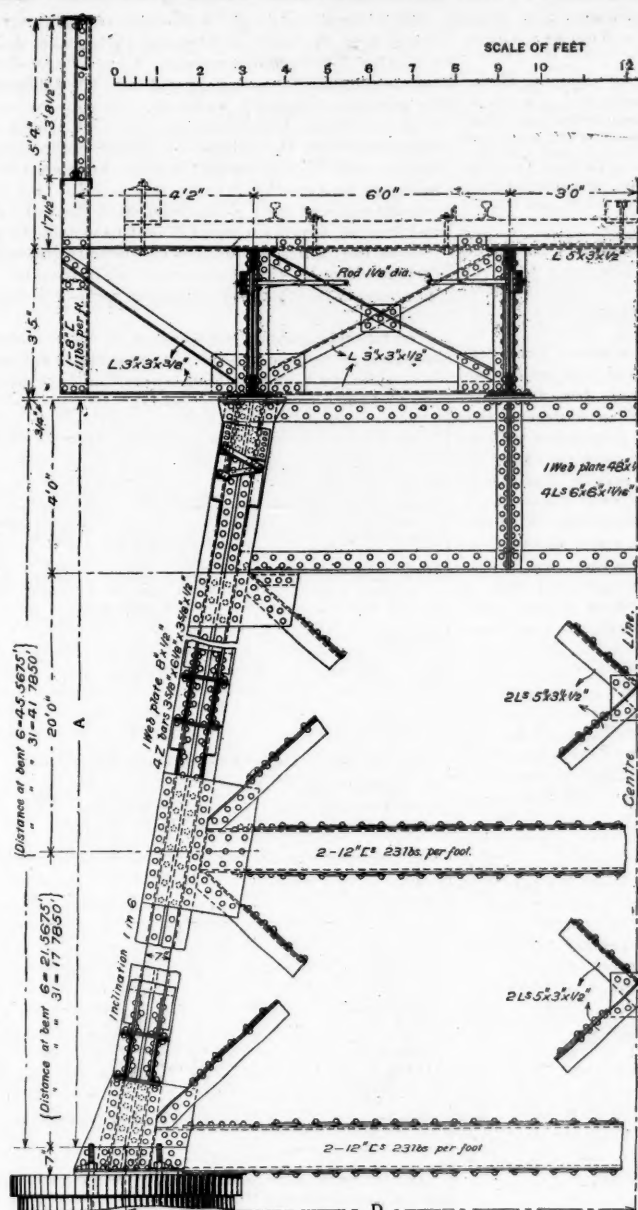


Fig. 1—Cross Section.

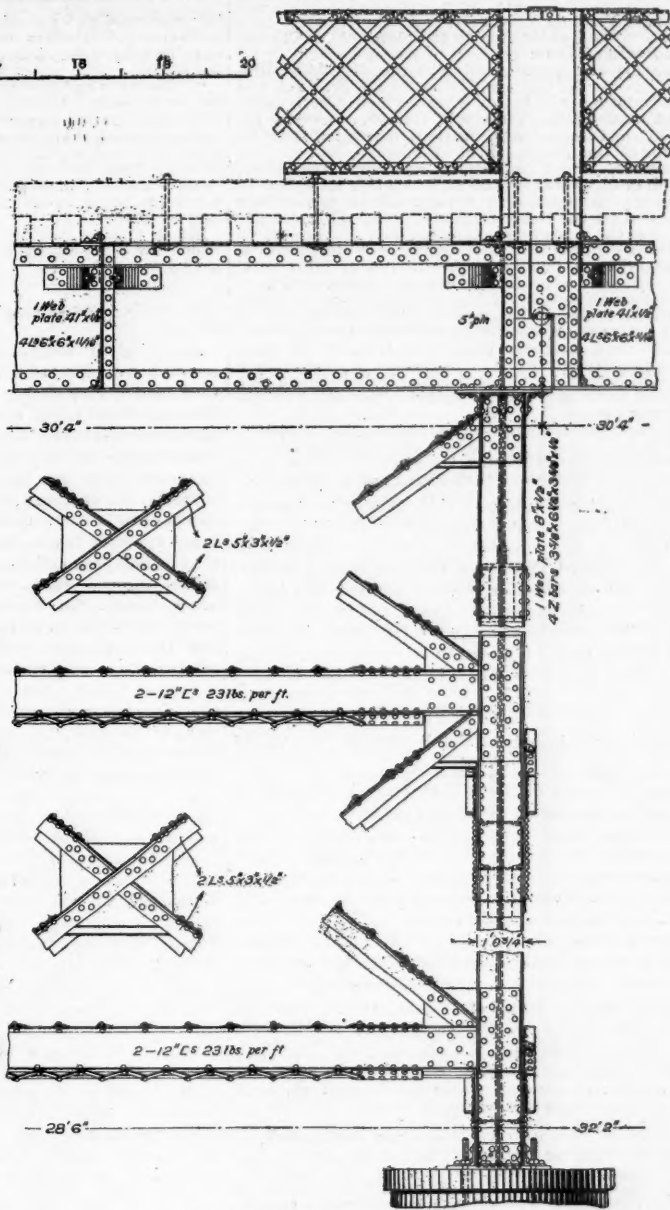


Fig. 2—Side Elevation.

APPROACH VIADUCT OF THE BELLEFONTAINE BRIDGE—ST. LOUIS, KOEKUK & NORTHWESTERN RAILROAD.

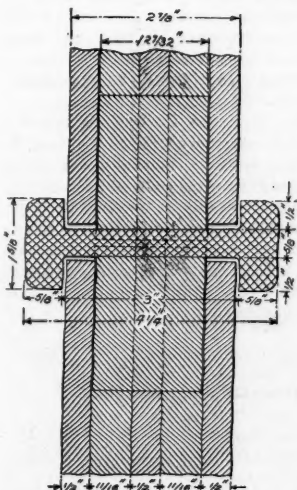


Fig. 3—Half Pins and Key—Bellefontaine Bridge Viaduct.

A single line of columns at the curb line will support the structure. The superstructure will be exceedingly light, as the weight of the rolling stock is so small that the greatest stresses to be considered are those produced by the wind. The motive power will be supplied by a sufficient number of 8-H. P. electric motors. These motors are so small that the greatest weight on one wheel will be but one-half ton. Excepting that everything will be more substantial and ornamental, the general design of trucks and platforms will be the same as that used on the pier at Jackson Park last summer, the greatest change being to cover part of each platform separately, instead of covering the whole road with a continuous stationary roof, as was done on the Pier. A part of the faster moving platform will be occupied by what will resemble small street cars, having seats for about six persons. It is proposed to make the sides and roofs of the cars of ornamental iron and glass. There will be ample room on the faster moving platform outside of the covered portion for those who desire to walk. Stairways will be provided at each street corner. The company organized to build these structures is

composed of business men, and whether or not the extensive plant above described is built the personality of the men interested in the enterprise would indicate that the device exhibited on the Pier at the World's Fair will before long be put to some permanent use.

#### Seventh Annual Report of the Interstate Commerce Commission.

We printed last week a synopsis of this report as it appeared in the news columns of the daily papers. The full synopsis prepared by Secretary Moseley, since received, contains certain other paragraphs of interest to our readers, which we print below.

"The operation and administration of the law have been successful. Boards of trade and commercial associations have, individually and through their national organization, passed resolutions recommending amendments of the act with a view to increasing its usefulness, and managers of the most important railroads have also declared their belief in the utility of the law's provisions and their confidence in the body charged with its administration. This is sufficient in itself to refute all the adverse criticism, often easily traceable to interested motives, to which the statute has been subjected. De-

fects in the law relate mostly to details, and any proposition for radical amendment of its principles should be subjected to the severest tests.

"Decisions of the Commission and the courts upon through routes and through rates are discussed. Under the current of decisions in United States courts, the facilities necessary to this privilege depend upon the voluntary action of the carriers. While wonderful progress has been made in railway transportation, the advance during the last 10 years toward supplying adequate means for through transportation is not sufficient to warrant reliance upon the spontaneous action of carriers for needed improvements. This is shown by citation of an agreement of members of the Southern Railway and Steamship Association, 19 years after its formation, to prevent continuous carriage over certain through routes, with joint rates, by the exaction of local rates on each road.

"A great portion of railway securities yield little or no return, and many railway managers claim this as evidence that the law deprives carriers of adequate revenue. The law can only operate to limit railway revenue by preventing unjust charges and undue partiality. The claim of these managers must rest then upon the proposition, that the law by prohibiting wrongs works injury to railway prosperity. Such a plea is anomalous. The evils which carriers bring upon themselves by mistaken policies of rate making or management, if not removable through their own efforts, are to be remedied by specific legislation; not by attacks upon the law with a view to its repeal or radical amendment. The people are thoroughly determined not to permit even a partial return to the railroad anarchy which prevailed before the interstate commerce law was passed.

"Cases pending in the courts to enforce orders of the Commission are mentioned as follows: One against the Lehigh Valley, relating to coal rates, in the eastern district of Pennsylvania. Another coal case originating at Nashville and against the Louisville & Nashville, in the middle district of Tennessee. The Import Rate case, on appeal to the Supreme Court of the United States, from a decision against the Texas & Pacific rendered by the Circuit Court of Appeals for the second judicial circuit. The Grand Rapids Free Cartage case against the Detroit, Grand Haven & Milwaukee, decided in favor of the Commission in the western district of Michigan, in which motion for a rehearing has been filed. One case against the Cincinnati, New Orleans & Texas Pacific and others, a long and short haul proceeding, now on appeal in the Court of Appeals, fifth judicial circuit, from a decision adverse to the Commission. Another long and short haul case in the Court of Appeals, ninth circuit, against the Atchison, on appeal from a decision in favor of the roads. Other long and short haul cases in courts are one against the Louisville & Nashville, in the southern district of Ohio, involving rates on beer; three in the northern and two in the southern district of Georgia, brought to enforce orders issued in cases brought before this Commission by the Georgia Railroad Commission; one in the eastern district of Tennessee against the East



Tennessee, Virginia & Georgia, and others, based on a case before the Commission on complaint of the Chattanooga Board of Trade.

There is also a case pending in the district of Minnesota against the Chicago, Milwaukee & St. Paul, and others, relating to rates on wheat which discriminate against Minneapolis in favor of Duluth. The case decided by the Circuit Court, northern district of Florida, in favor of the Florida Fruit Exchange, whereby the Commission's order prescribing maximum reasonable rates on oranges was sustained, is pending on appeal in the Court of Appeals, fifth circuit. Other proceedings mentioned are the Delaware State range case, decided in favor of the roads by the Circuit Court for the eastern district of Virginia; the case against the Northern Pacific and Union Pacific in the district of Minnesota, involving sugar rates from the Pacific Coast for longer and shorter distances; the appeal to the Supreme Court in the case of Messrs. Brinson and Orr, who refused to testify before the Commission and were upheld by the Circuit Court, northern district of Illinois; the mandamus case brought by the Commission in the southern district of New York to compel the Mallory Steamship Company to file and publish tariffs on through business to interior points.

Criminal proceedings are now pending in the eastern and western district of Missouri, the northern district of Illinois, district of Kansas, the district of Nebraska, the district of Indiana and the district of Washington.

In the matter of uniform classification the Commission not only holds that the railroads "should be urged on by legislation," but believes that sufficient time has been allowed the carriers to formulate a suitable plan and recommends that they be required to adopt a uniform classification within a year, and in case of failure that the government make one for them. In speaking of private cars it is stated that the payment of mileage on these cars now amounts to over \$30,000,000 a year.

#### Proposed Amendments to the Interstate Commerce Law.

Below is the text of the bill to compel railroads to agree on through rates, which was recently introduced in the United States Senate by Mr. Cullom and which was noticed in these columns last week. This bill (S. 1,183) contains but one subject, that of compelling a road to join another in making through rates between two points, even when it may have a line of its own between the same points. We also give the text of bill S. 1,184, which, as will be seen, covers the definition of the word "line" and also a modification of Section 10 of the law.

S. 1,183. *Be it enacted, etc.* That section three be amended by adding the following: "The facilities to be so afforded shall include the due and reasonable receiving, forwarding and delivering by every such common carrier, at the request of any other such common carrier, of through traffic at through rates or fares. If any one of such common carriers shall desire to form a through route for interstate traffic or any class thereof over its own line or any part thereof, in connection with the line, or any part of the line of one or more other common carriers, it shall address a request in writing to the other common carrier or carriers, describing therein the proposed route specifically, and naming proposed through rates or fares and divisions thereof for such traffic, and shall deliver such request to such other carrier or carriers and also transmit a copy thereof to the commission hereinafter named. If the other common carrier or carriers shall not, within ten days after receiving such request, make and serve and file with the commission written objections either to the proposed route or to the proposed rates, fares, or divisions, the same, so far as not objected to, shall be deemed agreed to; but if either the route, the rates or fares, or the divisions are objected to, the objection shall be stated in writing and transmitted to the commission, and the commission shall then have power to determine whether, having regard to all the circumstances, the route proposed is demanded in the public interest and is a reasonable route for the traffic, and if the commission shall so find, and the rate or divisions are not assented to, the commission shall have the further power to prescribe the same; but the commission in any case, in apportioning the through rate, shall take into consideration all the circumstances of the case, including any special expense incurred in respect of the construction, maintenance, or working of the route, or any part thereof, as well as any special charges which any such common carrier may have been entitled to make in respect thereof, and it shall not be lawful for the commission in any case to compel any company to accept lower mileage rates than the mileage rates which such company may for the time being legally be charging for like traffic carried by a like mode of transit, on any other line of communication between the same points, being the points of departure and arrival of the through route."

Said commission, at the request of any person interested in interstate traffic, shall institute, or on its own motion, said commission may begin proceedings to form through routes over connecting lines in the same manner, and to the same effect as though such proceeding had been instituted by a common carrier, as provided in this section.

S. 1,184. *Be it enacted, etc.* "The word 'line,' as used in this act, shall be construed to mean a physical line, whether such line be one railroad or two or more connecting railroads, or part railroad and part waterway, when both are used under a common control, management, or arrangement, express or implied, for a continuous shipment."

"Each railroad and each waterway and every part of each railroad and each waterway composing any such line shall be deemed a part of such line and transportation over the whole or any part or parts of such line shall be deemed to be transportation over the same line, whether the transportation service be rendered by a single carrier or by two or more carriers."

"The words 'any common carriers,' as used in this act, shall be construed to mean one or more than one common carrier, as the case may be and the context require."

Sec. 2. That section 10 of said act as amended March 2, 1889, be further amended by adding the following clauses thereto:

"Whenever any common carrier subject to the provisions of this act is a corporation, such corporation may

be prosecuted as for a misdemeanor under any of the foregoing provisions of this section, and upon conviction shall be subject for each offense to a fine of not exceeding \$5,000.

"Whenever an indictment shall be found under the provisions of this act against a corporation, the service of any writ or other process thereupon, or for the prosecution thereof, shall be sufficient if a copy of such writ or process be delivered to and left with any director, general officer, general agent, superintendent, division superintendent, or station agent of such corporation found in the judicial district wherein such indictment may be found."

Sec. 3. That so much of section ten of said act as provides for punishment by imprisonment is hereby repealed.

#### The Lehigh Valley Strike.

About half of the Lehigh Valley strikers have been re-employed. The men evidently did not understand their leaders very well and for the first few days after the settlement there was great disappointment that more were not taken back. Press dispatches indicate that business on the road is now running smoothly. It appears that the sleeping car service was discontinued at the outbreak of the strike, and it was not restored until Dec. 11. On Saturday last a non-union telegraph operator died at Wilkesbarre, and it was reported that he had been poisoned at a restaurant, but the inquest showed that death was probably due to other causes. On Monday the wages of yard engineers and firemen, and road firemen, on the Northern Division were reduced about 15 per cent. to equalize them with the rates on the other divisions, but according to the reports the reduction applies only to the men recently engaged; which, of course, includes some of the strikers. The yard engineers had been receiving \$3.60 a day for 12 hours. It was also announced that men over 45 years old would not be engaged as engineers, and one superintendent is said to have discharged three or four old men on this account, whom he had just re-engaged. On Saturday night a new man was beaten by a mob of union men at Perth Amboy, N. J. In Pennsylvania several re-employed strikers have been discharged for insulting new men. At the regular monthly meeting of the directors of the Lehigh Valley on Tuesday President Wilbur presented estimates from the General Traffic Manager and the Superintendent of Motive Power of the losses through damage to freight and equipment growing out of the strike, as follows: Damage to locomotives, \$46,000; damage to cars, \$19,000; damage to freight in wrecks, \$9,450; damage to perishable freight by delay, \$2,550; total, \$77,000. While the report contains no estimates of the general loss of traffic and increase of expenses growing out of the strike, it was given out that the company estimated the loss from those sources at about \$500,000, and the total cost of the strike at about \$600,000.

#### Railroad Matters in Chicago.

**Passenger Traffic.**—There was little change in the character of the passenger traffic from the preceding week. Through travel to winter resort points in the South Atlantic states showed a moderate increase. The Atchison, Topeka & Santa Fe also had a slight gain in Pacific coast business, but the other roads said there was a slight falling off from the same time last year; but net receipts from passenger earnings showed less shrinkage when opposite the corresponding time in 1892 than was expected.

The General Managers' Association devoted some time the past week to the pass question. Fifty-nine roads were represented either in person or by proxy. I judge that it is concluded that the evil has become so deep rooted that it will require considerable courage to deal with it as it deserves.

**Freight Traffic.**—Cold weather with severe snowstorms over a wide section materially interrupted business, and the increased grain traffic which was predicted failed to materialize, the aggregate deliveries for the week being 3,242,000 bushels, compared with 3,464,000 the preceding one, and 4,370,000 bushels the week ending Dec. 9, 1892. It is claimed that the loss was partly compensated by shipments direct from country points to Eastern markets, including Newport News, which is trying to compete with other seaboard ports for the export business, especially corn. The managers of some of the leading corn roads also state that they could increase their business with the cross country roads that are working for grain traffic with Philadelphia, Baltimore and Newport News, provided they would permit cars to go through to the East instead of unloading at connecting points. The objections of the Chicago lines to sending their cars through are that the compensation is not equivalent to the service, and that cars once in the possession of an Eastern road are not returned soon. Some Chicago roads hold that their interests are to bring the property here, and in consequence are not disposed to foster a cross-country business to the seaboard.

The livestock traffic was materially larger than the week immediately preceding. It also showed a small gain over the same time last year, and the prospects point to better business the balance of the month. There was a loss in the flour movement, but a very good gain in mixed tonnage; therefore, the shrinkage on the former will cut very little figure in earnings when placed opposite the latter, which pays much better rates,

The inbound coal traffic of the railroads bringing such freight from the Indiana mines, including the Chicago & Eastern Illinois and Louisville, New Albany & Chicago perceptibly increased, as did also the deliveries of the Atchison, Topeka & Santa Fe, Chicago, Burlington & Quincy, Alton, Illinois Central and Rock Island. The shipments from the mines to interior points are also much greater than the recent weekly average, and the prospects for a continued large business in that direction are reported good, as the roads state that orders for coal from all directions are sufficient to absorb the products of the mines as fast as they come to the surface. The only fear is that threatened labor troubles may culminate in restricting the output of some of the largest collieries.

The following shows the amount of flour and grain delivered at Chicago by each of the railroads mentioned during the week ending Dec. 9, and the corresponding week in 1892:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
C. & N. W.	Bbls. 7,789	Bush. 673,000	Bbls. 36,414	Bush. 937,000
Ill. Cent.	2,550	409,000	.....	552,000
C. & R. I. & P.	12,250	273,000	4,050	345,000
C. B. & Q.	6,022	668,000	26,611	1,182,000
C. & Alton	9,000	145,000	2,453	105,000
C. & E. Ill.	450	51,000	.....	103,000
C. M. & St. P.	15,730	572,000	40,500	619,000
Wabash	750	91,000	2,700	67,000
C. & G. W.	21,325	149,000	32,972	249,000
A. T. & S. Fe.	8,200	196,000	300	189,000
L. N. A. & C.	.....	4,000	.....	2,000
Totals	81,936	3,231,000	146,030	4,370,000

The following shows the deliveries of grain and flour at Chicago for 11 months ending Nov. 30, and the corresponding time in 1892, as reported by 11 of the leading Western roads to the Board of Trade:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
C. & N. W.	Bbls. 342,334	Bush. 22,359,000	Bbls. 478,561	Bush. 21,876,000
Ill. Cent.	71,083	20,448,000	9,195	17,255,000
C. & R. I. & P.	270,404	16,089,000	133,050	19,370,000
C. B. & Q.	390,955	32,892,000	484,811	38,566,000
C. & Alton	124,249	6,943,000	214,012	7,846,000
C. & E. Ill.	10,863	3,428,000	397	5,517,000
C. M. & St. P.	451,335	14,827,000	590,495	16,536,000
Wabash	23,007	5,555,000	11,570	5,697,000
C. & G. W.	365,114	4,412,000	705,780	8,665,000
A. T. & S. Fe.	44,234	6,877,000	8,322	9,420,000
L. N. A. & C.	1,314	379,500	1,294	6,800
Totals	2,005,192	135,117,000	2,680,929	151,356,000

The outward movement of freight was close up to that of the corresponding time last year, especially of merchandise. It is claimed that the roads are really getting better average rates than a year ago, as all the lines in the Western group claim to be living up to an agreed tariff. One general manager said: "I believe that the Granger roads for once recognize the fact that there is nothing to be gained by cutting rates. If it increased the general volume, there would be some palliation for the folly, but it does not."

The Atchison, Topeka & Santa Fe officials report a good winter traffic on the system west of the Missouri. In addition to miscellaneous freights the coal mines along the line are being vigorously worked, and the output is giving the road large traffic. As the country supplied is at present short of stock, a continued heavy business is expected through the winter. Its grain traffic from Kansas points eastward also continues above anticipations and proves that the crop of that state was materially underestimated.

CHICAGO, Dec. 11.

#### Trials of the New Gunboat Marblehead.

The official trial of the Marblehead took place on Dec. 7 under the most favorable conditions, and developed an average speed of 18.94 knots over a 72-mile course, 36 miles against and 36 with the tide. The contract speed was 17 knots, and this trial speed would have brought the contractors a bonus of \$175,000. But this rate when corrected for tidal influence gave a rate of only 18.44 knots an hour and a premium of \$125,000; lacking only 0.04 of 18.50 knots and a premium of \$150,000. The disappointment of the builders, Harrison Loring & Co., in the result reported by the Trial Board, has caused them to petition the Secretary of the Navy for another trial. In anticipation of a second test the engines and machinery are being overhauled and new coal put aboard. The lead of the steam valves is to be increased, to admit more steam to the cylinders and thus increase the number of revolutions of the screw, and it is hoped that the Navy Department will permit the use of a screw with a greater pitch. The trip was without accident, but after the trial, while endeavoring to get data regarding her turning angles, the brackets holding the steering drum broke down.

The steam gauge showed 168 lbs. pressure at the boilers and 165 lbs. at the engines. The average number of revolutions of the port engine were 176, and of the starboard engine 178 to 180. The temperature in the fire-room was between 145 and 155, and the air pressure varied



from .8 to 1.5 in., at the last reaching 2 in. The first part of the trip was made in 1 hour 58 minutes and 1 second, and the return trip in 1 hour 50 minutes and 5 seconds, or 3 hours 48 minutes and 5 seconds for the whole distance of 72 miles. The weather was fair and the sea smooth, with scarcely any wind.

### The Forging of Eye-Bars and the Flow of Metal in Closed Dies.\*

By H. V. Loss, M. E., M. Am. Soc. M. E.

(Continued from page 869.)

#### c.—Die Construction.

When referring to eye-bar machinery generally, no engineer familiar with the subject can do so without referring in strong terms to the Edge Moor Iron Co. No establishment could have devoted more time, money or a more untiring energy to improve the methods of this important branch of manufacture, and the present state of perfection owes its existence greatly to the results that have been obtained at that establishment. Referring to "the die construction," it would form quite a history to mention all the gradual steps that these parts have undergone, and the extent to which they have been experimented upon at those works.

When speaking generally about upsetting an eye-bar in a closed die, three distinct systems of dies can be used, and, in fact, they either have been or are used at the present time and really represent the three great steps in the evolution of the die mechanism of an eye-bar upsetting machine.

Again, speaking in a general way, any one of these systems can be considered as consisting of:

A movable plunger, or header, of equal or greater thickness than the eye-bar head to be made, and two neck or side dies—generally termed cheek dies—which are always stationary and bear against offsets in the sides of the main housing, containing the diebox. These dies are always of the same thickness as the head. The plunger and the cheek dies have the internal contour of the head to be made. Finally we have the top and bottom dies, either movable or stationary, these forming the top and bottom surfaces of the head.

The three separate systems may be classified as follows:

1. To upset a bar in a stationary die, the plunger being the only movable part.
2. To upset a bar in a die, the cheeks and bottom of which are stationary, the top and plunger of which are movable. Of course this order may be reversed, letting the top and cheeks be stationary, while the bottom and plunger move.
3. To upset a bar in a die, the only stationary parts of which are the cheek dies, the top, bottom and plunger all being movable.

Each of the above three systems represents a well defined and distinct result in its effect upon the bar, and will be treated separately hereafter.

With any and all of these systems it is an accepted construction to provide a separate gripping mechanism, located in front of the dies. The bar itself is therefore always stationary, the plunger being always movable. This "grip" will thus have to sustain the entire upsetting pressure, whatever it may be, until the neck of the eye has been formed sufficiently to throw the reaction upon the cheek dies, which then transmit it into the housing through "the offsets" on the sides. This being done, the grip is of course relieved throughout the remaining stroke. We will now proceed to the

#### First System.

When speaking in a general way of the forging of metals, when using closed dies a system of this kind is always in vogue. It is used in the manufacture of rivets, in the upsetting of rounds and squares and for many other purposes. It is therefore natural that it was also applied to the art of eye-bar making, in which line of manufacture it really represents the first and original step in "Die Construction." Referring to the previous general description of all three systems, it is seen that they all contain separate top and bottom dies. Such a construction is adopted to facilitate the removal of the bar after upsetting, as also to permit the insertion of the bar into the dies with ease and comfort. It serves, besides, an additional third purpose, namely, to allow a gradual thickening up as the upsetting takes place, which fact tends to lessen the necessary upsetting pressure and to allow the necessary stock for "finishing" the eye by whatever means that are adopted, viz., the hammer, press or rolls.

Coming back to the first system especially, it would require too voluminous an article to treat separately the different arrangements that have been tried and discarded in the effort to secure the best results. I will only mention the "double-decked" system, if such a term is permissible, at once tried and for quite a time used at the Edge Moor Iron Works. Dies were here arranged in series, one set above and on the top of the other, each set intended to do a part of the work and having internal contours more and more approaching the finished

form of the eye. Plungers were, of course, introduced to match each die.

The construction of dies, working under this system is of the very simplest kind, and needs no elaborate illustration. Take a stationary box, fig. 6, containing a hollow of the form of the finished eye to be made, introduce a plunger of a thickness equal to the thickness of the eye, and divide this box itself into four parts, two sides and top and bottom. This constitutes it all, while the minor details may vary to suit the form of the main housing, in which the diebox operates.

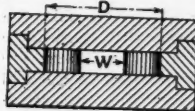


Fig. 6.

In the above fig. 6, D equals diameter of eye, and W denotes the width of bar. As to the effect upon the metal of this system of working, it is a very distinct one, viz., the bar will upset immediately at the plunger end leaving the neck as the last part

to be filled. The plan, fig. 7, shows the appearance of a partly upset bar. This action is invariably so with all classes of forgings, where this system is introduced. In upsetting rounds and squares it is again experienced.

Two great objections exist, however, with this system:

1. The gripping mechanism in front will have to be of extraordinary strength, as it will have to sustain nearly the entire upsetting pressure. The neck is the last part to be formed, and the grip is therefore not relieved, until all the work is practically done. For heavy sections this fact would mean a gripping machinery of huge dimensions and capacity.
2. As the bar is gradually being upset, the material, which already fills the die to a certain extent, at least vertically, will have to slide backward, being pushed by the plunger in front of it. The great friction thus overcome means a vast waste of power.

Wherever this method has been changed into one having dies with more or less movable parts, a very great decrease in the power necessary to do the work has invariably been the result. A great waste in friction means also a short life for the dies, a fact the importance of which no manufacturer can afford to overlook.

Altogether, the stationary diebox can be considered as abandoned in this branch of the arts, and has generally been replaced by one or the other of the following two systems:

#### Second System.

The natural consequence of any effort toward lessening the upsetting pressure in making an eye will be a deviation in the line of movable dies. Such a result is, indeed, represented by the second system, with which either the top or the bottom die can slide. Generally a sliding top die is preferred, as the stationary bottom makes an easier construction and forms a convenient table or platen for the manipulation of the bars.

A very good arrangement of dies, designed to work under this system, is shown in cross-section by fig. 8. The bar A is located between the cast iron dies B and C. The former is attached to a movable steel block or die D, while die C is fastened to the stationary platen E—also made of steel and extending forward like a table. H is the side grip and I the plunger, made of hard forged steel, while K is an attachment to

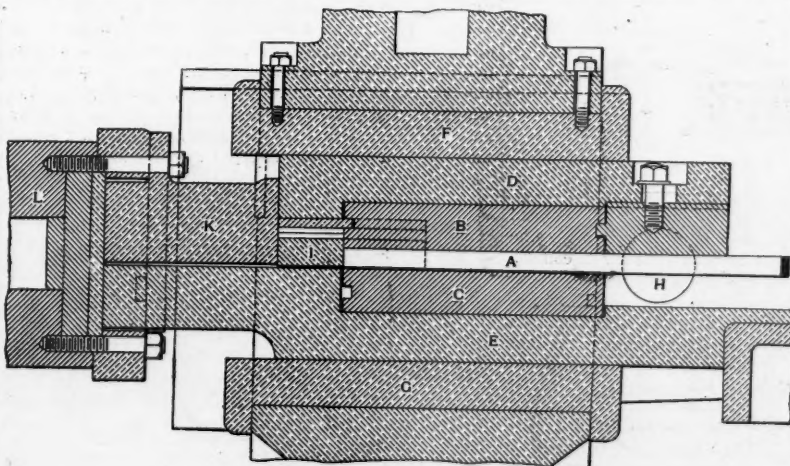


Fig. 8.

the piston of the pushing cylinder, which is operated by hydraulic pressure. F is a stationary steel block, attached to the underside of a piston, working in a vertical hydraulic cylinder, which cylinder performs the function of a die-closer. The drawing shows the position of dies after a completed stroke, the ram L coming to a stop against the backward projection of the stationary platen E.

The above construction of dies was used in connection with the "Second Method," thus forming a complete eye in the upsetting machine, followed by a subsequent rolling process.

With this system is experienced another and equally distinct effect upon the material, as shown by fig. 9, which represents a partly upset bar. As will be seen, the upsetting action occurs about simultaneously at both ends, the middle part of the eye being the last portion filled. This peculiar

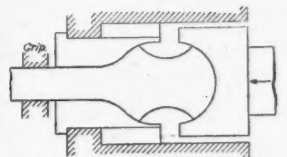
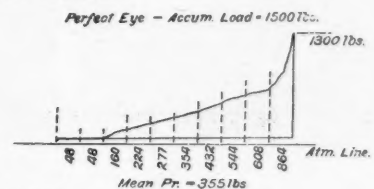


Fig. 9.

result is due, first, to the plain action of the plunger—similar to the effect, in stationary dies, in upsetting the portion in immediate contact with it—and secondly, to the dragging effect of the sliding die on top or bottom, which has a tendency to force the metal against the cheek dies. The practical results of this construction are beneficial in many ways. The grip is more quickly relieved, thus requiring only a smaller machine to attend to this function; and the final upsetting pressure needed to complete the eye is very much less, as compared to what is required with the stationary diebox. The final effect of the plunger is to eject between it and the side dies the surplus of material, which has to exist in order to insure a perfect eye, this part of the bar being, therefore, the one last formed.

As an experimental verification of the pressures and resistances encountered in forming an eye with this system, the indicator card, fig. 10, shows clearly the work done at the different periods throughout the stroke. The card is taken from an ordinary steam indicator, actuated by water, however, and which is connected to the main pushing cylinder through a pressure-reducing mechanism of a latitude of about 40 to 1. The bar was a small one—3 in. wide by 3/4 in. thick with a 6 1/2 in. eye—the "Second Method" being used of completing the contour in one operation, followed by rolling. The diameter of water cylinder was 24 in., and the water pressures per square inch of piston are marked on the card at different intervals, so as to readily show the power needed.



3 x 3/4 x 6 1/2 in. eye, steel.  
11 1/4 in. tot. stroke.  
2 in. before strik. bar.  
3/4 in. high-pres. water.  
Water run constantly on dies, plunger and forging slab.  
Plumbago grease used on dies.  
Hor. ram worked freely.

Fig. 10.

The grip was in the above case arranged to engage the bar on its edges, and was located very close up to the cheek-dies, thus being underneath the projecting part of the movable top die, when this die is in the position of a completed stroke. See fig. 8.

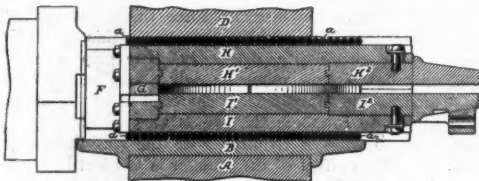
It is essential always to have the grip located as close up to the cheek-dies as possible to prevent the bar from buckling vertically, and the more so with the first and second systems, as the gripping mechanism is in these cases generally made to attack the bar on its edges. The exposed part of the bar—between plunger and grip—represents a column, which, if too long and with an edge grip, would sway vertically at its very point of support, viz., the grip. A top and bottom engagement would certainly hold the bar firmer and the comparative value of the two constructions—as measured by their effect—would be about as two columns, the grip ends of which are fixed in one case and supported in the other. The top and bottom engagement offers also a very largely increased bearing surface for the same gripping pressure, which again results in a decreased cutting action on the material and a very much less defaced appearance generally. While such a grip could be used for small bars with the first system, its application to the second system is rather doubtful, as it is possible that the neck is not formed quickly enough to relieve the grip before any serious resistance is encountered, and the additional



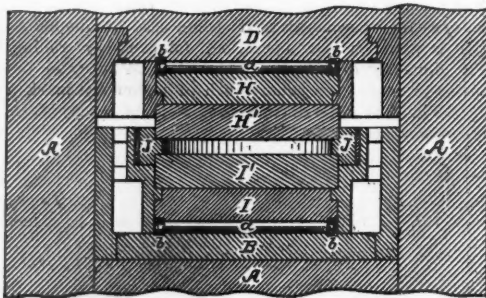
distance away from the diebox, at which such a grip would have to be located—to clear the moving top die—would result in a column too long and too heavily loaded. With the third system, however, the above suggested arrangement can be used to advantage, as will be mentioned in the following. The second system is applicable to both methods—first and second—and is used by the majority of steel eye-bar makers at the present time. The writer has always considered it successful and only inferior in its actions and principles to the final and

### Third System.

While the system just described is a great improvement upon the stationary die, it nevertheless requires very large efforts for heavy sections, and it was while trying to decrease the amount of this effort that the third system was developed. The movable diebox, as patented by the writer, and used with this construction, is shown very plainly by figs. 11, 12 and 13.

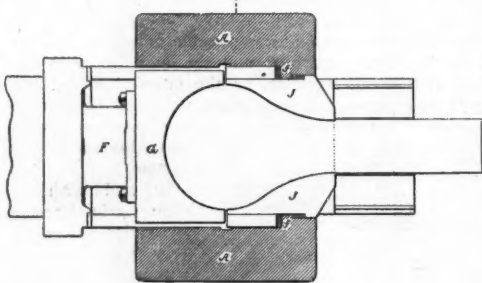


H<sup>1</sup>, H<sup>2</sup>, I<sup>1</sup> and I<sup>2</sup> are here movable cast iron dies, while H and I are steel platens, also movable. B is a stationary slab, resting in the main housing A, while D is connected to the vertically moving holding-down ram, which is actuated by water. G is the plunger, J—J are the cheek-dies, and F is attached to the upsetting ram. To diminish the friction when moving the diebox, friction rollers a—held together by the

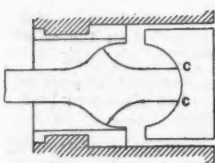


frames b—are inserted between the stationary and movable parts.

The above die construction is in successful use at the Pencoyd Iron Works with a smaller machine, designed originally for 6 in. wide bars with about 13½ to 14½ in. diameter of head. It was found after trial, however, that the power as provided could finish an 18-in. eye on an 8-in. bar—the housing being wide enough to accommodate this diameter—with simply one reheating. The larger machine mentioned at an earlier



stage of this paper as being designed for 36-in. head on a 16-in. bar, was planned by the writer for the same works. The "Second Method" is used in connection with this system at the above-mentioned works, the bars being finished by rolling. As to the effect of the upsetting action upon the material, this is shown by fig. 14, which represents a partly finished eye. *The*



carried forward so rapidly that no upsetting action can occur at the plunger end, until near the completion of the stroke. It must be remembered in this connection that the holding-down cylinder or die-closer bears

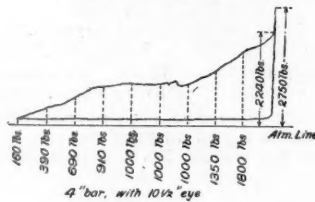
on the top of the upset portion of the bar with an immense pressure, running up to from 1,000,000 to 5,000,000 lbs., depending on the size of the machine.

It is plain that this peculiar action facilitates the rapid filling of the head with a minimum amount of pressure, and it also permits the use of a top and bottom grip, as the length of the column can well be tolerated, barring possible for very small and thin bars, because the longitudinal force acting upon it is not sufficient to buckle it vertically.

For such small dimensions where danger does exist, it is a common custom with both of the latter two die systems, to "double up"; that is, to upset two bars in one operation. Such a procedure practically doubles the resistance to buckling, as it takes very little more force to form a neck on a bar of twice the thickness, the main resistance being always concentrated at the end of the stroke. By this act of "doubling up," the product is also largely increased, and the difficulties in separating the bars after upsetting are generally not serious. The beneficial effect of a top and bottom grip can thus be secured by an application of this system, and such grips are used in connection with the present machine and also with the larger one planned for the Pencoyd Iron Works.

As in the previous systems, the plunger and cheek-dies come together at the center of the eye, ejecting at this point the surplus material, the plunger being also somewhat less than a semi-circle to allow for the stretch, caused by the subsequent rolling.

As to the resistances encountered throughout the stroke, a reference to the indicator card, fig. 15, will reveal one fact, which, however, might have been suspected from what has been said previously, namely, the large amount of work done in the earlier part of the stroke. This is emphasized by comparing it to the card, fig. 10, representing the second system. Such



being the case, it is, therefore, natural that as so much work has been done during the commencement, that much less remains to be done during the final part of the stroke; which means, *that the same eye can be upset with less pressure by this system than by any of the preceding ones.*

With machines, as designed exclusively for very small bars, it matters not which of the latter two systems is used, as the saving in power is here of minor importance. In fact, for very thin bars the second system offers the advantage of a grip close up to the cheek-dies, but for any ordinary machine, proportioned to take the heavier bars of the market, say, from 5 in. and up, the writer is absolutely convinced from actual experience of the superiority of this third system. The power is less and top and bottom grips can be used, which two facts in themselves are sufficient to place this construction in advance of any of the two preceding ones.

With the latter two systems friction rollers have sometimes been introduced between the stationary and the sliding parts, and such a construction has proved to be of a decided advantage.. They will have to be close together and to be backed by good steel surfaces, the rollers themselves being made of hard steel, to stand the intense pressure under which they work. Of course, when the pressure is at its maximum, the speed of motion is at its minimum, which fact helps considerably to save them. Such rollers are applied to the construction, shown in figs. 11 and 12, and may be anywhere from  $1\frac{1}{4}$  to 2 in. in diameter, depending on their load. I have not hesitated to burden them with a maximum pressure of 3,000 lbs. per running inch.

(TO BE CONTINUED.)

**The Brainard Garbage Crematory in Chicago.**

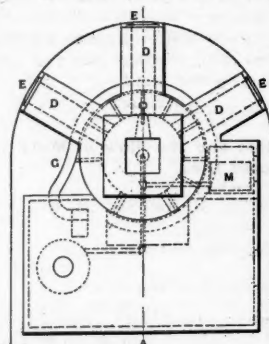
The new garbage crematory at Superior street and the Chicago River in Chicago was started Nov. 27 for a continuous test of 70 days before being accepted by the city. It will be run day and night without intermission, three shifts of men being employed to keep it in operation. Its capacity is rated at 100 tons a day, and the expense is estimated as follows:

18 men at \$1.50 a day.....	\$27.00
3 " " \$2.50 " ".....	7.50
500 gallons of oil at 1 1/4 cents.....	6.25
Coal.....	2.50
Ground rental.....	3.50
Gasoline for illuminating.....	.50

This is the daily expense for the consumption of 100 tons of garbage which the crematory is guaranteed to burn, and makes the price of disposal 47.25 cents a ton after delivery on the premises.

This crematory, of which illustrations are given, is

the invention of Mr. A. M. Brainard, and is a departure from the style of those previously tried in this country.



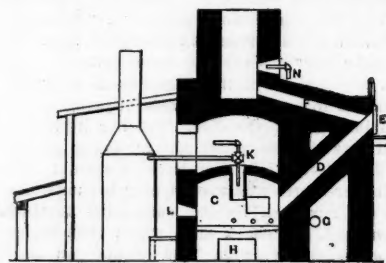
The crematory chamber, *C*, is circular in form, 8 ft. in diameter, instead of an elongated furnace like the Rider and Engle, the two principal ones now in use in this country. Leading down to the circular chamber are three chutes, *D*, inclined at an angle of about 45 deg., the upper openings at the doors, *E*, being on a level with the staging on which the

garbage is dumped from the gathering carts. The staging is reached by an incline. The mouths of the chutes are closed by sliding doors, *E*, balanced by counterweights. Leading off from each chute, just inside the upper opening, is a nearly horizontal flue, *F*, opening into the chimney; through these three flues the products of combustion pass on their escape from the furnace.

Encircling the crematory chamber is a large galvanized iron pipe, *G*, with small pipes leading from it to the interior of the chamber, like the tuyeres of a blast furnace. When the natural draft produced by the chimney does not supply sufficient air for complete combustion, or when it is necessary to force the crematory, air is blown through this pipe. The grate bars are iron and are kept from burning out by the green garbage which is continually raked over them. The raking is done by a man who operates the long iron rake through the opening *L*. The residue is removed from the pit through the openings *H*, of which there are two. This residue makes an excellent filling.

The necessary heat is supplied by burning crude petroleum blown in by a steam jet. The tank *M*, holding the petroleum, is placed higher than the burner, and the oil running down by gravity unites with the steam at the burner *K*. Surrounding the tank are steam coils which keep the oil in a fluid state. Another peculiarity of this crematory is that the flame impinges directly on the garbage from above instead of sweeping over it in a manner of a reverberatory furnace. The steam under a pressure of between 60 and 80 lbs. is supplied by a small vertical boiler. A small engine supplies power for the blower.

The garbage after being dumped on the staging is shoved into the chutes and slides down into the chamber where it meets the flame. On its way down it comes in contact with and is thoroughly dried by the hot gases



on their way to the chimney via the chutes *D* and flues *F*. That the combustion may be as complete as possible, and to prevent odors escaping into the atmosphere, there is at the base of the chimney an emergency burner *N*, which is lighted when necessary. It is seldom found necessary to light this burner.

This crematory is not the first in which petroleum is used; fuel petroleum was also burned by the Engle company in its plant at the World's Fair grounds. The Engle crematory used much more oil than the Brainard does, as the Engle has three burners in continuous use. The Brainard crematory has embodied a principle which up to the present time seems to have been overlooked by American inventors; that is, drying the garbage before it comes into contact with the flame, and doing this by the heat of escaping gases and at no additional expense. There seems to be room for improvement in the details, however, such as the substitution of firebrick grate bars for the iron and blowing heated air into the furnace instead of cold air. Should the test prove satisfactory, and the crematory be accepted by the city, quite a move toward the establishment of a better sanitary condition of affairs in the city will have been made.

### A. Water Supply Tunnel.

The headings of the tunnel through the mountain near Winsted, Conn., built to give that town a new water supply, met on Dec. 10. The tunnel is about three-fifths of a mile long and has been built in nine months. It cost \$91,000, but \$45,000 of this amount was contributed by private individuals.



## The Osnabrück Track Museum at the World's Fair.

We have long wished to give some adequate illustrations of the beautiful track exhibition made at the World's Fair by the Georgs-Marien Iron Works of Osnabrück. This was a liberal transfer to Chicago of the most valuable and characteristic examples, collected by Mr. A. Haarmann, the General Director of the George-Mary company, the author of "Das Eisenbahn-Gelände," the best book on track that was ever written. We have already told our readers something of the scope of this collection, particularly in Mr. Paine's article, Nov. 3. Naturally the collection showed the development of Mr. Haarmann's personal theories of track construction, the latest stage of which was shown by Mr. Paine. But it showed a great deal more. The *Scientific American* has invaded our territory and done what we ought to have done, and engraved a number of the best examples shown in that collection; and we take the liberty of transferring to our pages the illustrations and description published in that journal in its issue of Dec. 9:

In point of time the earliest age of transit is represented by the plank road (fig. 1), the "Pontes Longi," or "long bridges," described by the Roman historian Tacitus. This exhibit is an actual piece of a road laid about the fifth year of the Christian era, by Domitius. It was 10½ miles long, over a marsh called Dievenmoor, near Osnabrück. It is now covered with six feet of peat and moss. It was excavated in 1892. It is to some extent the predecessor of our modern plank roads. It will be noticed how the planks are split out radially from the trunk. It is said that after exhumation it had to be dried in the dark to prevent it from falling to fragments.

This structure, laid on longitudinal sleepers, and not intended so much for wheeled vehicles as for horse and infantry, is followed (fig. 2) by a primitive wooden railroad or tramway. Here we have wooden rails simply spiked down on wooden sleepers. Later improvements consisted in "gaining" the rails into the sleepers, so as to prevent spreading, and in facing the tops of the rails with a strip of hard wood easily replaceable or with a plate of iron. To a coal mine proprietor named Beaumont, of Northumberland, the construction with sleepers is attributed, in the year 1630. The example shown is from the Apostle mine, Transylvania. Simple planks laid without sleepers antedate this construction.

The next cut (fig. 3) is an early example of iron railroad work, constructed by R. J. Curr, in Wales, in 1800. The rail is supported at its joints on rough stones about 2 sq. ft. in area and about 8 in. thick. The rails were a yard long. The spikes were driven into wooden dowels set into holes drilled in the stone. This primitive road ran from Merthyr-Tydvil to Aberdare Junction. In 1804 Richard Trevithick experimented with an unsuccessful locomotive engine on this road.

The form of cast iron rail shown in fig. 4 is of more modern section. It dates back to 1789, its constructor bearing the name of Jessop. The ends of the bottom flange were enlarged to give a better support. Each rail was between 3 and 4 ft. long. This exhibit was a model; no original being obtainable.

Still keeping to stone sleepers we see in fig. 5 a very curious rail laid by George Stephenson for the Stockton-Darlington line in 1825. This is a forged and rolled rail designed by Berkinshaw. It was laid on stone sleepers with cast iron chairs. The rail was fish-bellied between the sleepers, and had a slight foot flange. Stephenson here fastened the chairs directly by wooden trenails driven into holes drilled in the stone. The rails were 15 ft. long. A pin passing transversely through the web secured the rail to the chairs.

Next we are introduced (fig. 6) to the transverse tie or sleeper of wood, which not only supported the rails, but also held them laterally so as to prevent spreading. We also see an early example of the fish plate. Between the wooden ties stone sleepers are seen, their use being abandoned with reluctance. The rail was spiked down by dog-head spikes, dowels being employed for the stone sleepers. A line of this construction was laid on the Bavarian state railroad as late as 1866.

The United States supplies the example shown in the cut (fig. 7) from the Georgia Central Railroad, referred to 1851. Transverse sleepers carry longitudinal sleepers which are sometimes gained into the transverse ones and sometimes rest on their upper surface. The rail of wrought iron was of rebated section, so that the head of the spike was below the tread. The sleepers of the

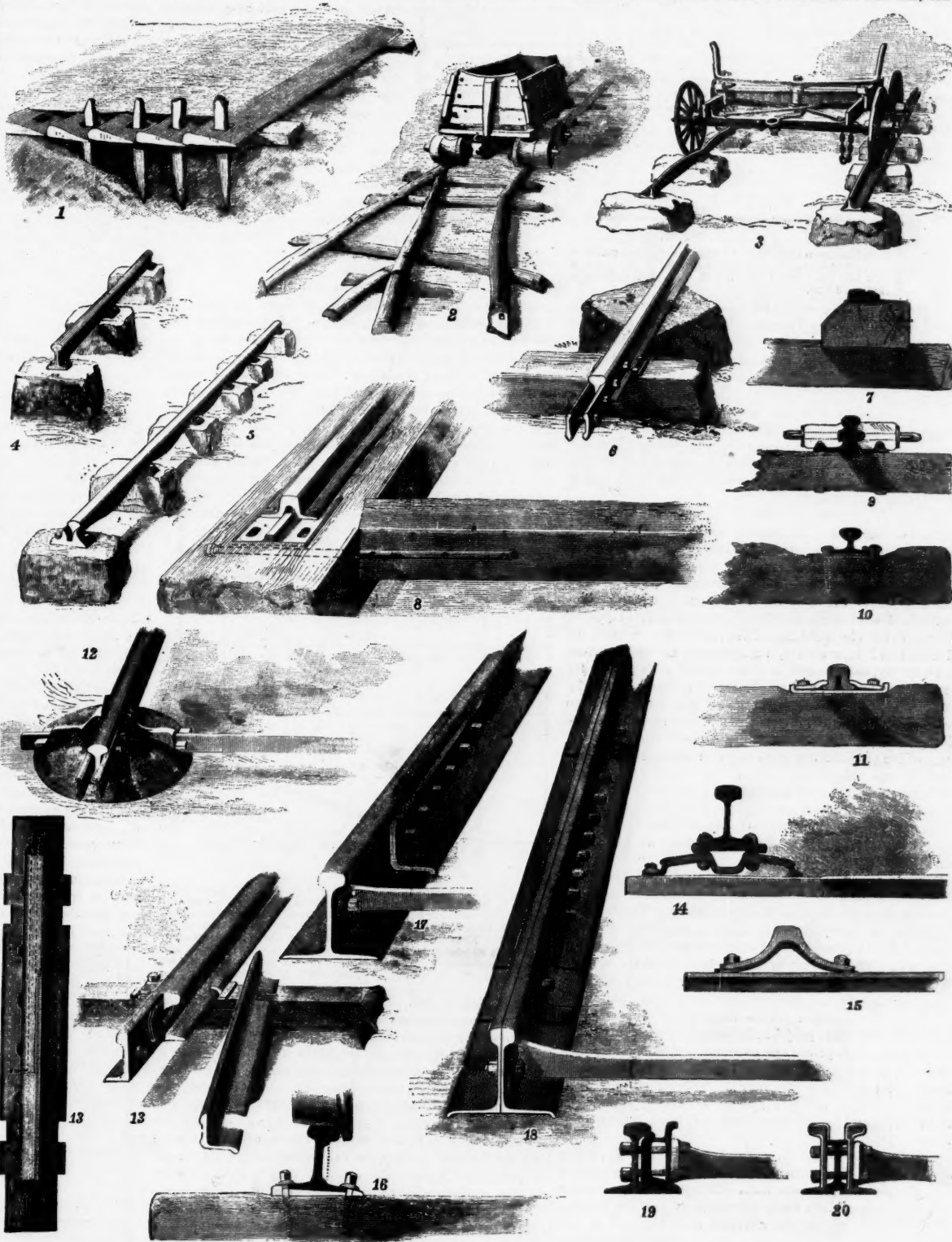
upper and lower sets were fastened to each other by trenails. The peculiar hooked or bent plate used at the joints is indicated in the cut.

Fig. 8 shows a rail construction used on the Great Western of England, by Isambard Brunel, before 1850. Here the longitudinal sleepers carry the rail.

In fig. 9 we see an example of the double-headed rail from the Bombay, Baroda & Central India Railroad, referred to the year 1852. The constructing engineer was W. Bridges Adams. The distinguishing peculiarity of

ing a total of four for each rail. Seven sleepers were provided for each rail.

The iron works of the exhibiting company, the Georgs-Marien-Bergwerks und Hütten-Vereins, Osnabrück, Prussia, gives us an example of modern practice (1890), shown in fig. 13. It is an arrangement for avoiding butt joints. The rails are rolled of peculiar section, the web being at one side of the center, a distance equal to its own thickness. From the ends of the rails the foot and head are cut off as shown in the cut, leav-



TRACK EXHIBIT OF THE GEORGS-MARIEN COMPANY—WORLD'S FAIR.

this system was the use of double longitudinal sleepers, running along with the rail, and between which the rail was held by bolts passing through the web of the rail and the wood on each side. The bolts had no heads, were slotted at each end, and web-shaped keys were driven into the slots. Transverse sleepers were used to prevent spreading.

In fig. 10 we have an example of German practice of the year 1838, from the Leipzig-Dresden line, in Saxony. Here we have the familiar flat base or single head rail section held in a chair at the joints, and elsewhere resting directly on the transverse sleepers. The section differs from the modern rail in being less deep. Its foot also is wider in proportion to its other dimensions than is that of the modern rail. In the exhibit the rails and chairs were original, the other parts were supplied.

Fig. 11 is another German example, dating back to 1842, from the Breslau-Oppeln line, in Prussia. It was laid on cross ties, a very unusual arrangement with this type of rail. In the exhibit the wooden ties were not original, but had to be supplied.

Fig. 12 shows cast iron sleepers from the Alexandria-Cairo line in Egypt, laid by H. Greaves in 1854. The sleepers are segments of spheres or pot-shaped, made of cast iron, cast about the chair so as to make one piece with it. Double-headed rails held at the joints by fish plates and transverse-keyed spacing bars are used. The spacing bars were distributed one on each side of the rail joint and two intermediate between the joints, giv-

ing the thickness of the web unchanged. By laying the rails with webs to right and left alternately the scarf joint shown is secured with double thickness of web under it. The rail is of steel and it is laid on soft steel sleepers, and is held by hooked chairs and clips. Deep, angular fishplates are used at the joints.

In fig. 14 is a sample of rail construction used on the Berlin-Stettin road in 1882. Here we have a soft steel longitudinal sleeper, with rail clamped to its top. At the joints a fishplate was used which clamped both rail and sleeper.

In fig. 15 we have a saddle of self-supporting rail, laid on the Great Western road in England in 1855. The joints were secured by riveted fishplates. This is interesting as being the first road laid without sleepers.

Fig. 16 exhibits one of the last examples of Continental design (Germany) for countries where wood is abundant. The rail shown in fig. 13 is used for this, but is canting inward to resist overturning strains.

In fig. 17 we see the principle of fig. 13 applied to a broad-footed rail, to be laid without sleepers. This is one of the heaviest rails in the world, weighing 127 lbs. to the yard.

Fig. 18 shows a similar construction which has already had ten years' use on German lines. Here a compound rail is employed instead of the single one of ordinary construction.

Figs. 19 and 20 show, finally, rail systems for use in city streets. Here we see the usual single-rail system departed from.



### An Important Experiment in Locomotive Counterbalancing at Purdue University.

On the invitation of Prof. W. F. M. Goss, of Purdue University, a party of engineers from Chicago and vicinity visited La Fayette, Ind., to witness some

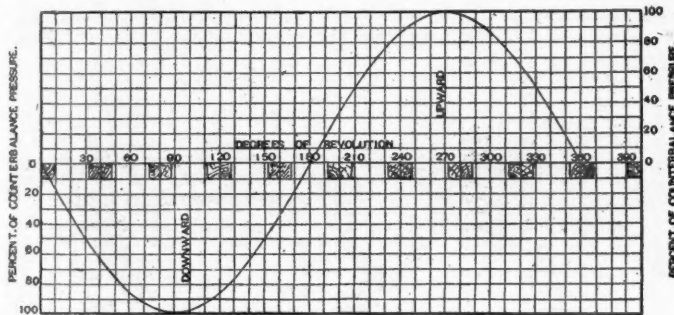


Fig. 17.

Diagram showing the percentage of the maximum counterbalance pressure on the track which is exerted at different points during a complete revolution of a locomotive driving wheel when the track is rigid and does not deflect under the load due to the counterbalance pressure.

experiments made with the locomotive shop testing plant, which has been described before in the *Railroad Gazette*. The objects of the tests were to determine, if the counterbalances of locomotive drivers caused the wheels to lift from the rails at common speeds. To determine this, wires of circular section were passed between the drivers and the carrying wheels when the locomotive was running. The visiting engineers found the apparatus in perfect condition and the experiment was carried out without a failure of any sort. Before describing the results of the tests, it is well to say a few words about the plant.

Purdue University is one of the most successful schools in the West. Its faculty realized a few years ago that locomotive steam engineering would soon take a more important place in mechanical engineering. They have felt as others have that railroad mechanical engineering is much neglected by the associations of men who should encourage individuals to literature on the subject. The American Society of Mechanical Engineers is quite apathetic toward railroad engineering, being much more concerned with stationary engines and pumps, and the Master Mechanics' Association has failed to take advantage of its opportunity to make scientific investigations; hence there is not now a society or association in this country that has given to locomotive engineering the attention which the importance of the subject demands. The most important work has been done by the several railroad clubs. It is perhaps unnecessary to call attention to the fact that locomotive designers have to proceed blindly in new work because of the lack of accurate data about existing types.

It was a realization of this which prompted the Massachusetts Institute of Technology to start a course of locomotive engineering several years ago. This course has been hampered from the start by the want of information; that is, data that are reliable and on which it is safe to base the instruction of students. With a true Western spirit and boldness, Professor Goss conceived the idea of gathering his own data in a way that could not be disputed, and single-handed he succeeded in winning over to his project the faculty of the University at Purdue. It required the expenditure of a large sum of money to get a full size and complete modern locomotive across the prairies into the college grounds and mount it with a complete outfit of testing apparatus, but the locomotive is there, and has been doing good work in giving students a better idea of locomotive action than can be given, or has been given, in any other institution in this country. The work of the students has already brought out data enough to give several practical conclusions about locomotives, not the least of which is, that under the average conditions it is not economical to wire-draw the steam through the throttle. Another is that the most perfect counterbalance that can be given to a locomotive is one which balances the entire weight of the revolving and reciprocating parts.

The success of the locomotive apparatus has probably had something to do with the increased confidence which the legislature of Indiana has in the university and its officers. A large sum of money has recently been appropriated for a considerable increase in experimental and manual training work. A magnificent new building has been built and will soon be ready for occupancy. The number of students is now 700 and has been doubled within a short time. As it stands to-day, the best source of accurate information about some of the details of standard locomotive steam practice is Purdue University, whereas, according to our way of thinking, the source ought to be the Proceedings of the American Society of Mechanical Engineers and the Master Mechanics' Association.

When the party of engineers reached the university they found the locomotive running. The speed was increased to 35 miles an hour to show the action of the machinery, and thereafter was increased to 60 miles an hour to show the effect of the counterbalance. The locomotive is of the eight-wheel American type, having 3-in. drivers and 17 x 24 cylinders. For further de-

scription see the *Railroad Gazette*, 1892, pp. 365 and 742. The locomotive was built by the Schenectady Locomotive Works and is an exact duplicate of their standard eight-wheel engine.

Wires having a circular section  $\frac{3}{4}$  of an inch in diameter, and about as long as the circumference of the wheel were fed from a gaspipe placed in front of one of the rear drivers between the line of contact of the driver and the carrying wheel. The normal weight of the locomotive is sufficient to flatten the wire very thin, giving a width of flattened wire about  $\frac{1}{8}$  of an inch. The maximum pressure of the counterbalance increases the width of this flattened wire somewhat. Opposite the counterbalance, on the tire, there is an indentation made that leaves a raised projection on the flattened wire which assists in locating the wire with reference to the counterbalance.

The following are some of the results of these tests:

Speed of circumference of wheel 60 miles an hour or 88 ft. per second. Revolutions per minute about 320. Diameter of wire  $\frac{3}{4}$  in. Drivers lift from the rail so as to give a short length of full sized wire before a speed of 40 miles an hour is reached. The drivers lift when the counterbalance is up. Since the engine was received the counterbalance has been increased so that now the weight of the reciprocating parts is completely counterbalanced. The longitudinal oscillations of the engine, known as "galloping" are very small and are caused by the angularity of the connecting rod which makes it impossible to counterbalance perfectly with a

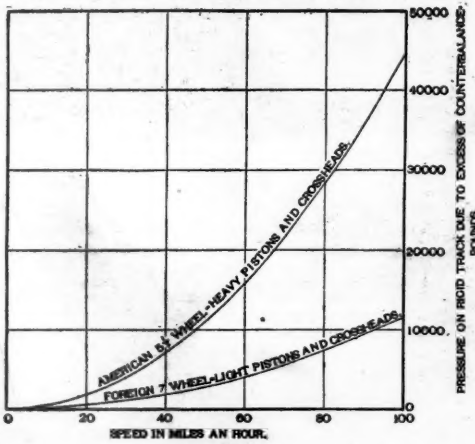


Fig. 18.

Diagram showing the maximum pressure on a rigid track due to that portion of the counterbalance of a locomotive that is used to counteract the horizontal effect of the reciprocating parts of American and foreign locomotives of the same size of cylinder. This diagram also illustrates the reduction of the variation of pressure of a driving wheel upon the track that follows an increase in the diameter of the driving wheels and a reduction of the weight of the reciprocating parts.

finite length of rod. The shorter the connecting rod with reference to the crank, the less is the possible perfection of the counterbalance.

At 60 miles an hour the length of the full section of the wire is 30 in., corresponding to about 55 deg. of revolution. The exact height of the lift of the wheel cannot be measured with the present apparatus, but it is known that the wheel is  $\frac{3}{4}$  in. from the rail at the beginning of the 30 in. and is going up rapidly, and reaches a distance of  $\frac{3}{4}$  from the rail in its downward course at the end of 55 deg. The total lift may be as much as  $\frac{1}{2}$  or  $\frac{3}{4}$  in., probably not more, at a speed of 60 miles an hour.

It is evident that the wheel travels upward less rapidly than it falls as the distance measured on the wire from the full flattened part to the point of the commencement of the full section is greater than the distance during which the drop takes place. Apparently the wheel rises  $\frac{3}{4}$  of an inch in 63 deg. and drops  $\frac{3}{4}$  of an inch in 12 $\frac{1}{2}$  deg. of revolution, thus showing that the fall of the wheel to the rail is more rapid than the rise from the rail. This is in accordance with the theory of action for the reason that going up the wheel lifts against the force of gravity and the driving spring, while coming down these forces act downward with the motion of the wheel.

The most important conclusion from these experiments is that under normal conditions the drivers lift from the rail, and probably this takes place in every-day practice where locomotives are run at 40 miles an hour and upward. Other conclusions may be drawn from the results, but this is the principal and the safest one.

As supplementing this experiment we reproduce a part of the paper by Mr. D. L. Barnes, on 'American and Foreign Locomotive Practice,' which was read before the Engineering Congress, Civil Engineering Section, and which forms part of the *Transactions* of the American Society of Civil Engineers.

American locomotives ride easier than the foreign on account of the longer springs, the higher boilers, and the greater total weight. The counterbalancing, fore-

and aft, is quite perfect here, but more counterbalance is used; not more in proportion to the amount of the weight to be balanced, but more in total; the reason being that much less attention has been paid to the reduction of the weight of the reciprocating parts in the United States than in other countries. Perhaps the reason is, that to reduce the weight of reciprocating parts beyond a certain limit entails a decided increase of cost; but whatever be the reason, one finds the weights of the pistons, crossheads, piston rods and connecting rods heavier on engines in this country than in Europe. A fair estimate of the proportion of the weights of these parts, as used here and in foreign countries, is as follows:

Foreign.....	1
American.....	2.38

Recently more attention has been paid to the reduction of the weights of reciprocating parts of locomotives in the United States, and a few of the latest designs have 25 per cent. less reciprocating weight to be balanced than is found in the average American practice.

If there should be allotted to counterbalancing of locomotives the importance that is given it by some of our railroad track and bridge experts it would perhaps be necessary to class the heavy reciprocating parts used here as a distinctive feature, and a bad one, of the construction of American engines. It is not uncommon for our track experts to advocate the removal of that portion of the counterbalance which is put in to counterbalance the reciprocating parts. Recently attention has been so strongly directed to this matter here that a step in advance has been promised, and light cast-steel and wrought iron pistons are being talked of; but the improvement proposed is small and does not give the light weight of reciprocating parts that is found in other countries.

It is not just to say that all American engines have such very heavy reciprocating parts as has been indicated here; but as a rule American engines have these parts much heavier than is necessary, and this leads to the excessive counterweights, which have given ground for a just criticism of this feature of American locomotive design. For instance, some compound locomotives have been built in this country with a single piston weighing over 800 lbs. The builders did not realize at the time the result of this, and put in as much counterbalance as was necessary to make the engine ride well. The result was almost disastrous to the track at 60 miles an hour, the maximum pressure on the rail reaching nearly 50,000 lbs. per wheel. At this speed the wheels of this engine lifted from the rail when the counterbalance was up and seriously affected the track when the balance was down, as has been the case before both in this and other countries when engines have been overbalanced. In several instances, both here and abroad, short sections of track have been badly damaged by running overbalanced engines at high speed. In one case it was caused by running an engine with small wheels at high speed without the parallel rods.

The comparative effect of counterweights of some American, English, German and French high-speed locomotives is given in fig. 19. This diagram, when read in connection with figs. 15, 16, 17 and 18, shows how the distribution of the weight of a locomotive on the track is affected by the counterweight, and by the

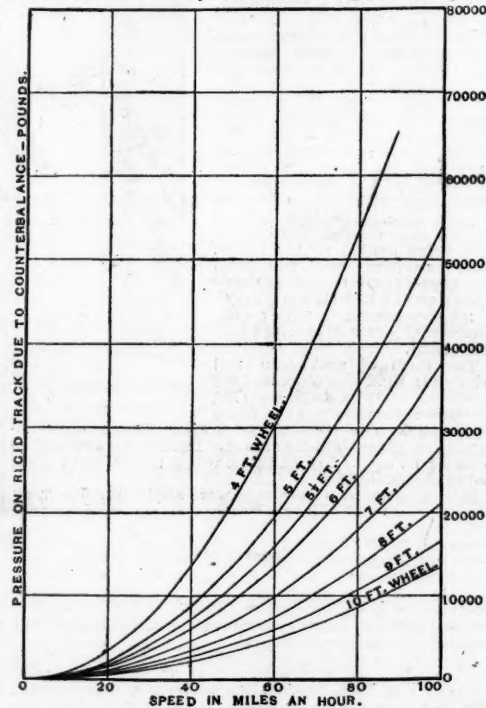


Fig. 19.

Diagram showing the decrease in the maximum track pressure, of that part of the locomotive counterbalance that is used to counteract the horizontal effect of the reciprocating parts which accompanies an increase in the diameter of the driving wheels on the same engine with the same reciprocating parts, 18 x 24 in. cylinder.

deflection of the rails when engines are moving at high speed. All these matters so affect the limit of weight that is admissible on one driving-wheel that those who have to determine the limit for any given track need to make



careful analysis of the detail designs of locomotives in order to reach safe conclusions. Such analysis is one of the duties of the railroad civil engineer, and in studying this problem, the long lengths of track over which is spread the downward action of the counterbalance, as shown by fig. 17, must not be forgotten.

It has been shown that it requires time for a wheel to drop into a depression in the track, and how this materially affects the load on a weak joint, yet this statement needs modification to the extent that it is affected by the distance between the center of revolution and the center of gravity of the driving wheels. This distance is about 1.3 in. for the wheel considered in the counterbalancing for an American engine, given in fig. 18. A wheel will follow instantly any deflection of rail up to the amount of the distance of center of gravity from center of figure, and therefore on a track having such elasticity that it would deflect under the additional load brought upon it by the counterweight, nearly as great a distance as that between the center of gravity of the wheel and its center of figure, there would be but little additional pressure brought on the rail by the centrifugal tendency of the counterbalance, the reason being that the wheel would then revolve nearly on its center of gravity, and would have, therefore, but little centrifugal tendency.

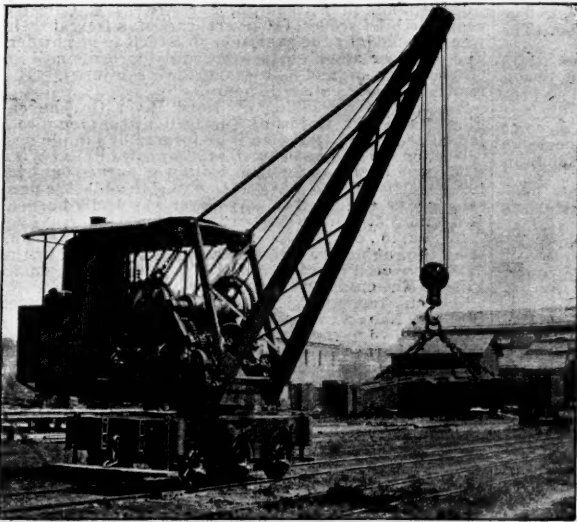
This is an example of the extreme condition, and only serves to illustrate more clearly the point now being made, which is that such deflection of the track as actually takes place on good roadbeds reduces materially the effect of the counterbalances. In this matter some have erred by assuming the whole centrifugal tendency that would exist if the wheel revolved on its center of figure, and the track did not deflect under the increased load. Such deflection of the track as actually does occur has a large modifying effect on the variation of pressure on the rail, caused by the centrifugal tendency of the counterbalance for the reciprocating parts. No doubt the flexible track used here has decreased considerably the damage that would otherwise have resulted from the use of heavy reciprocating parts if our track had been laid on a more rigid roadbed.

Centrifugal action is not, strictly speaking, a force, but is only a tendency, and does not exist unless the wheel is constrained to revolve on a point outside of its center of gravity. In a large, heavy wheel, if the counterbalance be light, the distance from the center of gravity to the center of revolution is so small that the centrifugal tendency that would exist on a rigid track is greatly reduced on a comparatively flexible track.

Some further discussion of this whole matter will be found in the editorial columns.

#### The Halsey Locomotive Crane.

As shown in illustration this crane is lifting 11 tons on a radius of 18 ft from the center of the track without clamping to the rails or blocking. It is so designed as to be able to adjust the radius of the jib with the load suspended from 12 ft. radius to 23 ft. radius, and is capable of rotation in either direction and can travel along the track at the rate of 10 miles per hour. The truck is



The Halsey Locomotive Crane.

constructed to give a flexible wheel base and the structure is carried on heavy locomotive springs. The driving wheels are of the locomotive type, with turned steel tires shrunk on and crank pins set on the quarter stroke. The four wheels are coupled together by side rods and driven by an auxiliary shaft and crank disks that run in adjustable bronze-metal boxes. The auxiliary shaft has a steel bevel gear keyed to it that engages with a bevel pinion, which is rotated by a vertical shaft passing through the center pin, which in turn receives its motion from a shaft lying horizontally and at right angle with the engine shaft, the motion being transmitted by bevel wheels. The machinery platform is held in position by a hammered steel pin and is supported by four rollers, which roll on a slewing rack. The lat-

ter, which is set loose on the truck, is so designed as to prevent the breaking of the rotating gearing in case a man reverses the direction of rotation too suddenly. The gearing will reverse, but the rack will slip. All the movements are independent of each other. The clutches are all tooth clutches excepting the rotating, which are friction clutches. The tooth clutches are automatic in their engaging and disengaging when the operating lever is set for its work. Both drums are provided with powerful band brakes. The engines are designed for 100 lbs. steam pressure and have the reversible link motion. The boiler is of steel, hydraulic riveted, and tested to 150 lbs. pressure. The coal bunker and water tank carry a supply sufficient for six hours' work. The machine is very heavy and will stand the roughest usage. All parts are in easy access and any piece can readily be detached. This machine was designed with the intention of being used as a shifting engine as well as for lifting purposes, coupling chains, platform steps and hand brakes being provided at each end of the truck.

This crane is made by W. S. Halsey & Co., Birdsboro, Pa.

#### Train Accidents in the United States in October.

##### COLLISIONS.

##### REAR.

1st, 10 p. m., on St. Louis & San Francisco, at Limon, Mo., a passenger train ran over a misplaced switch and into some empty freight cars standing on the side track. The engineer and fireman were killed and one passenger was injured. It is said that the switch had been maliciously misplaced and that other attempts had been made near the same place to wreck the passenger train.

2d, 5:30 a. m., on Cleveland, Cincinnati, Chicago & St. Louis, at Edgemont, O., a freight train ran into the rear of a yard train, wrecking the engine and several cars. Two tramps were killed and two others injured. An employee at work clearing the wreck was fatally injured. It appears that the yard train was infringing on the freight train's time.

5th, on Pittsburgh, Cincinnati, Chicago & St. Louis, at Jewett, O., a freight train ran into the rear of a preceding freight, wrecking 10 cars. The engineer was injured by jumping.

6th, 5 a. m., on Louisville & Nashville, at Gethsemane, Ky., a freight train descending a grade broke apart in two places and the caboose, which was stopped on a bridge, was run into by a following freight; and the engine, caboose and 10 freight cars fell 30 ft. to the stream below. The bridge was wrecked; engineer and one brakeman killed.

6th, on Central of New Jersey, near Newark, N. J., a passenger train ran into the rear of a preceding freight, wrecking the caboose and one freight car. One passenger was injured. There was a dense fog at the time.

7th, on Pittsburgh, Fort Wayne & Chicago, near Massillon, O., a freight train in descending a grade broke in two and the two foremost cars in the rear portion of the train were derailed, probably by a drawbar which had fallen upon the track. These two cars were pushed to one side and the rest of the rear portion of the train passed on, and afterward ran into the forward portion, doing considerable damage. The loss of the two derailed cars from the train was not discovered until the conductor came to check up his list afterward.

7th, on Perkiomen Railroad, near Allentown, Pa., a freight train broke in two and the two portions afterward came together, making a considerable wreck. Two trainmen were injured.

11th, on Yazoo & Mississippi Valley, at La Place, La., a freight train ran into some cars standing on the main track, wrecking 8 of them. The engineer and one other trainman were injured.

11th, on Michigan Central, at Chesaning, Mich., a passenger train ran into some freight cars on the main track, making a bad wreck. Three trainmen were injured.

11th, 10 p. m., on Chicago & Northwestern, at Dayton, Ia., a freight train ran into the rear of a preceding freight, wrecking the caboose and several cars. The wreck took fire and most of it was burned up. One conductor was killed and his body burned and an engineer injured.

13th, on Central of New Jersey, near Dunellen, N. J., a freight train broke in two and the rear portion afterward ran into the forward one doing slight damage. The conductor was injured.

13th, 9:40 a. m., on Michigan Central, at Jackson, Mich., a westbound excursion passenger train just starting from the station was run into at the rear by a following excursion train of 12 cars, wrecking two cars, badly damaging a third and derailling the first car in the second train; 12 passengers were killed and 25 injured, one fatally. The engineer of the second train, William Whalen, was badly injured. Engineer Whalen stated that he applied the air-brakes some distance back, and that they worked on the tender, but apparently did not work on any of the cars. He then whistled for hand brakes, but it was too late. This accident has been reported in the *Railroad Gazette*. No cause other than the negligence of the engineer has yet been discovered, so far as we have learned.

14th, 1 a. m., on New York, Chicago & St. Louis, at Athol Springs, N. Y., passenger train No. 3 ran into some freight cars standing on the main track, making a bad wreck. The fireman was killed and the engineer and express messenger injured. It is said that the cars had been blown out of a side track by high wind.

17th, on Philadelphia & Reading, at New Columbia, Pa., a freight train ran over a misplaced switch and into some freight cars standing on the side track. The engine and 11 cars were badly damaged, and the engine of a freight train standing on another track was derailed. Three trainmen were injured.

17th, 5 a. m., on Pittsburgh, Fort Wayne & Chicago, at Beaver Falls, Pa., a freight train descending a grade broke in two, and the rear portion afterward ran into the forward one, wrecking 12 cars. The station building was badly damaged and the telegraph operator injured.

17th, on Cleveland, Columbus, Cincinnati & Chicago, at North Manchester, Ind., a passenger train ran into the rear of a freight train, which was entering a side

track, badly damaging both engines, the freight engine being at the rear of its train. Two passengers were injured.

18th, 3 a. m., on New York, Ontario & Western, at Oswego, N. Y., a freight train ran into the rear of a preceding freight, wrecking the caboose and three cars. The wreck took fire from the stove. One brakeman was injured.

19th, on Philadelphia & Reading, near Trenton Junction, N. J., a freight train ran into the rear of a preceding freight, making a bad wreck. One conductor was injured, two tramps killed and four injured.

20th, on Pittsburgh & Lake Erie, at Fallston, Pa., a passenger train ran over a misplaced switch and into some freight cars standing on the side track. The engineer jumped off and was injured.

20th, on Baltimore & Ohio, near Clarksburg, W. Va., a circus train ran into the rear of a preceding circus train, wrecking two passenger cars and several others. One man was killed and several injured. The point of collision was on an ascending grade; the first train was heavy and running slowly and the second was light and running fast.

24th, 3 a. m., on Columbus and Western, near Opelika, Ala., a freight train descending a grade broke in two and the rear portion afterward ran into the forward one. A brakeman was injured.

26th, 4 p. m., on Houston, East & West Texas, near Leggett, Tex., a passenger train ran into the rear of a preceding freight, doing considerable damage. One passenger was injured.

27th, on Chicago & Erie, at Alger, O., a passenger train standing on a side track was run into at the rear by an empty engine, approaching the station at too high speed. There was a dense fog at the time. Three passengers were injured.

27th, 4 a. m., on Northeastern of South Carolina, at Salem Mills, S. C., passenger train No. 35 ran over a misplaced switch and into some platform cars loaded with lumber standing on a side track. The engine was badly damaged and the engineer, fireman and one passenger were injured. It is said that the switch had been maliciously misplaced.

27th, on Buffalo, Rochester & Pittsburgh, near Scottsville, N. Y., a freight train ran into the rear of a preceding freight, the flagman having gone back to his train without putting down torpedoes. A brakeman was fatally injured.

31st, on New York, Lake Erie & Western, at Rowlands, Pa., a freight train ran into the rear of a preceding freight, derailling the engine and 14 cars. The fireman was killed.

And 34 others on 23 roads, involving 6 passenger and 51 freight and other trains.

##### BUTTING.

4th, on Chicago, Milwaukee & St. Paul, at Ferguson, Ia., butting collision of freight trains, wrecking both engines, several cars and a part of the station building. The engineer, who is said to be at fault, was injured. The report states that he had fallen asleep on the engine and that he ran into the other train while it was at a standstill.

7th, 3 a. m., on Chicago, Rock Island & Pacific, near Keats, Kan., butting collision between a passenger train and a freight, making a bad wreck, a part of which took fire. The passenger fireman and one mail clerk were killed; four other trainmen were injured.

11th, on Wheeling & Lake Erie, near Valley Junction, O., butting collision of freight trains, damaging both engines and wrecking four cars. One engineer was injured.

14th, 6 p. m., on Pittsburgh, Fort Wayne & Chicago, near Shreve, O., a freight train ran over a misplaced switch and into another freight train standing on the side track, damaging both engines. Both firemen were injured, one fatally.

14th, on Norfolk & Western, at Kimball, W. Va., butting collision between a passenger train and an empty engine. A mail clerk was injured.

15th, 2 a. m., on Chicago, Rock Island & Pacific, at Paxico, Kan., butting collision between a passenger train and a freight, making a bad wreck. Two tramps riding on the passenger train were killed and three trainmen were injured. It is said that the passenger train disregarded a telegraphic order.

15th, 5 a. m., on Cleveland, Akron & Columbus, near Warwick, O., butting collision of freight trains, wrecking both engines and 15 cars. A brakeman was injured. It is said that an operator failed to deliver an order.

16th, on Pittsburgh, Fort Wayne & Chicago, near Loudonville, O., butting collision of freight trains, wrecking several cars. One fireman was killed.

17th, on Atlantic & Pacific, at Cosmo, Ariz., butting collision of passenger trains, badly damaging both engines; 3 trainmen badly injured. The eastbound train disregarded a telegraphic order.

19th, on Yazoo & Mississippi Valley, near Roxie, Miss., butting collision of freight trains, badly damaging both engines and several cars. Four trainmen were injured.

20th, 4 a. m., on Chicago & Grand Trunk, at Nichols, Mich., butting collision between eastbound passenger train No. 6 and westbound passenger train No. 9, killing 26 passengers and injuring 24, two of them fatally. Two passenger cars in No. 9 were telescoped and immediately took fire, most of the bodies of the persons killed being badly burned. The eastbound train disregarded an order to wait at Nichols for the westbound. This accident was reported in the *Railroad Gazette* of Oct. 27.

22d, on Pittsburgh, Fort Wayne & Chicago, at Monroeville, Ind., butting collision between passenger trains 4 and 25, badly damaging both engines. Eighteen passengers and 4 trainmen were injured. There was a dense fog at the time, and it is said that No. 4 approached the station at uncontrollable speed.

22d, on Staten Island Rapid Transit road, at Tottenville, N. Y., a passenger train ran over a misplaced switch and into the head of another passenger train standing on the side track, doing considerable damage. The conductor was crushed to death between two passenger cars and the fireman was badly injured.

23d, on St. Louis, Iron Mountain & Southern, near Mandeville, Ark., butting collision of freight trains, badly damaging both engines and five cars. A brakeman who jumped off was killed. There was a dense fog at the time. It is said that the southbound train disregarded a telegraphic order.

And 7 others on 7 roads, involving 3 passenger and 11 freight and other trains.

##### CROSSING AND MISCELLANEOUS.

3d, 8 a. m., on Lehigh Valley, at Catasauqua, Pa., a freight train of the Lehigh Valley collided with a freight train of the Catasauqua & Fogelsville at the crossing of the two roads, making a bad wreck. One fireman was killed and one engineer injured. The sig-



nalman at the crossing signaled both trains to go ahead about the same time, the signals evidently being not interlocked. A few minutes after the collision this signalman, Thomas Baer, went to his house near by and committed suicide, shooting himself with a pistol.

4th, on Montpelier & Wells River road, at Lanesboro, Vt., collision between an empty engine and a freight train, wrecking several cars. A brakeman was killed.

5th, on Lehigh Valley road, at Slatington, Pa., collision of freight trains, wrecking a large number of cars; two trainmen injured, one fatally.

6th, 1 a. m., on Central Vermont, at Norwood, N. Y., a freight train standing at the station was run into by another freight, wrecking 8 cars. One fireman was fatally injured.

6th, on Pennsylvania road, near New Boston Junction, Pa., a Lehigh Valley passenger train ran into a Pennsylvania coal train, wrecking 3 freight cars. One brakeman was killed. It is said that a telegraphic order was misread.

7th, on St. Paul & Duluth, near Barnum, Minn., a passenger train ran into a work train which was wrongfully occupying the main track, badly damaging the engine and wrecking the caboose. The engineer was injured.

8th, on Philadelphia & Reading, near Exeter, Pa., the front portion of a freight train, which had broken in two, being pushed back to make connection with the rear portion, bumped the latter so hard as to derail one car and foul the adjoining main track. A moment later a freight train on that track ran into the wreck, and the engine and 15 cars fell down a bank. The conductor of the last named train was killed.

10th, on Central of New Jersey, at Scranton, Pa., collision of passenger trains, doing slight damage. One passenger jumped off and was injured.

11th, on Pennsylvania road, near Huntingdon, Pa., collision of freight trains, wrecking 15 cars. One brakeman was injured.

14th, at Wilders, Ind., a freight train of the Louisville, New Albany & Chicago ran into a freight of the Chicago & Erie at the crossing of the two roads, wrecking both engines and several cars. The station building was damaged. One engineer and the operator in the station were injured.

14th, at Gallatin, Mo., a freight train of the Wabash backed into a freight of the Chicago, Rock Island & Pacific at the crossing of the two roads. Several passengers in the Wabash caboose were injured.

14th, on Boston & Albany, at Chester, Mass., a westbound freight train, crossing a single track temporary bridge, was run into by an eastbound freight train which approached the entrance to the gauntlet track at uncontrollable speed. The caboose and two cars of the westbound train were wrecked and the conductor and one brakeman injured, the latter fatally.

16th, on Southern Pacific, at Oakland, Cal., a passenger train approaching Oak St. Station was not properly controlled and ran into the side of another passenger train. One passenger was injured.

17th, on Pennsylvania road, at Altoona, Pa., a passenger car loaded with employees going from the lower to the upper yard was struck in the side by an eastbound freight train at a crossover track, badly damaging the passenger car and overturning the stove within it. Twenty employees were injured, six of them seriously.

17th, 6 a. m., on Cleveland & Pittsburgh, at Wellsville, O., the eastbound Pennsylvania limited passenger train, running over this road in consequence of a wreck at Beaver Falls, ran into a switching engine in the yard, doing considerable damage. The engineer and fireman, a Cleveland & Pittsburgh engineer acting as pilot, and the express messenger were killed and three other trainmen were injured. There was a dense fog at the time.

18th, on Delaware, Lackawana & Western, at Utica, N. Y., freight train ran over a misplaced switch and into the side of another freight, doing considerable damage. Two trainmen were injured. There was a dense fog at the time.

19th, 11 p. m., on Illinois Central, at Otto Junction, Ill., a northbound passenger train was run into at the side by a freight train coming from a branch, several passenger cars being damaged. Seven passengers and one trainman were injured. It is said that the signal showed all clear for the passenger train.

19th, on Western Maryland, at Shippensburg, Pa., a freight train standing at the station was run into by some cars which had broken loose from a Pennsylvania freight train, wrecking several cars. A man in the caboose was injured.

20th, on Pennsylvania road, at Seybert, Pa., a passenger train ran into a coal train which fouled the main track, and several cars were wrecked; conductor and fireman injured.

20th, near Savannah, Ga., a passenger train of the Charleston & Savannah was run into at the side by a yard engine of the Central of Georgia, badly damaging two passenger cars. Four passengers were injured.

26th, at Memphis, Tenn., an engine of the Chesapeake & Ohio ran into an engine of the Louisville & Nashville at a crossing of the two roads and knocked the tender of the latter off the track; it then ran some distance through the yards at high speed, having been deserted, and ran into some freight cars, badly damaging several of them. A man on the Louisville & Nashville was injured.

30th, on Ohio River road at Chestnut Hill, W. Va., a northbound passenger train ran into the side of a southbound freight which was partly on a side track. The engineer and fireman were injured.

31st, on Norfolk & Western, at Norfolk, Va., a freight train ran over a misplaced switch and into some cars standing on an adjoining track, which were pushed against another freight running in the opposite direction. The wreck was a bad one, three trainmen being killed and three injured.

And 28 others on 22 roads, involving 8 passenger and 42 freight and other trains.

#### DERAILMENTS. DEFECTS OF ROAD.

10th, on East Tennessee, Virginia & Georgia, near Demopolis, Ala., a Louisville & Nashville passenger train was derailed, and several cars fell down a bank; conductor, fireman and several passengers injured. It is said that the accident was due to a broken rail.

11th, on Northern Pacific, near New Rockford, N. D., the rear car of a passenger train was derailed by a broken rail and overturned. Twenty passengers, all men, were injured. The car took fire from the stove, but no great damage was done by the flames.

16th, on Southern Pacific, near Argenta, Nev., a car in a passenger train was derailed by a broken rail; one passenger injured.

18th, on Union Pacific, at Bavaria, Kan., a freight

train was derailed by a defective frog. The engine was overturned and nine cars wrecked. The engineer was killed and one trainman injured.

22d, on Kansas City, Memphis and Birmingham, near Eldridge, Ala., a passenger train was derailed on a small trestle which had been weakened by fire. It is said that a passenger car was piled upon the engine and that the wreck took fire, but that no persons were injured.

24th, on Indiana & Illinois Southern, near Effingham, Ill., the rear car of a passenger train was derailed and overturned. A car was split open and all the 13 passengers in it were injured. The conductor was also injured. It is said that the track was in very bad condition.

25th, 7 p. m., on Toledo, Ann Arbor & North Michigan, near Hamburg, Mich., a freight train was derailed at a point where the track had suddenly sunk about 8 ft., and the engine and five cars, including a car of oil, were piled up and consumed by a furious fire which broke out in the oil car. The engineer, fireman and one brakeman were buried in the wreck, and their bodies burned up.

And 5 others on 5 roads, involving 3 passenger and 2 freight trains.

#### DEFECTS OF EQUIPMENT.

2d, on Southern Pacific, at Winnemucca, Nev., a freight train was derailed by a broken journal, and four cars wrecked. A brakeman was fatally injured.

5th, on Columbus & Western, near Dadeville, Ala., a freight train was derailed by a drawbar which fell upon the track, and the conductor was injured.

8th, on Western New York & Pennsylvania, at Sonoma, N. Y., a freight train was derailed by a broken wheel and 9 cars were wrecked. A man stealing a ride was killed.

13th, on Philadelphia, Wilmington & Baltimore, at Newport, Del., a freight train was derailed by a broken axle and several cars wrecked. The wreck fouled the adjoining main track and a passenger train ran into it. One freight brakeman was killed.

22d, 6 p. m., on Cleveland, Canton & Southern, at Kent, O., a freight train was derailed by a drawbar which was pulled out and fell upon the track, making a bad wreck. Two brakemen were injured.

23d, 2 p. m., on Baltimore & Ohio Southwestern, near Rays, O., the engine of a Cincinnati, Hamilton & Dayton passenger train exploded while running at high speed, and the tender and baggage car were derailed and ditched. The engineer and fireman were injured.

25th, 6 p. m., on Pennsylvania road, near Lawrence, N. J., a westbound freight train was derailed by a broken axle, making a bad wreck, which fouled all four tracks. An eastbound passenger train ran into the wreck and the engine and four vestibuled sleeping cars were ditched. The car bodies were torn from the trucks, but only two or three persons within were much injured. Two tramps were killed and four injured, and the engineer, fireman and two porters of the passenger train were injured.

27th, 3 a. m., on Louisville, Evansville & St. Louis, near Blufford, Ill., a passenger train was derailed, probably by a broken axle, and a sleeping car overturned. Three employees were injured.

30th, on New York, New Haven & Hartford, near Mamaroneck, N. Y., a passenger train was derailed, while running at full speed, by the breaking of a driving wheel axle. A brakeman was slightly injured.

And 24 others on 17 roads, involving 3 passenger and 21 freight and other trains.

#### NEGLIGENCE IN OPERATING.

2d, on Chicago, St. Paul, Minneapolis & Omaha, at Windom, Minn., 6 empty cars in the middle of a freight train were derailed and wrecked by the sudden stoppage of the front part of the train by the air-brakes as the train approached the station, the engineer fearing a collision with another train standing on the main track. Several tramps riding in one of the cars were injured.

10th, on Pittsburgh, Fort Wayne & Chicago, at Whiting, Ind., a passenger train, running slowly, was derailed by a misplaced switch and the engineer and fireman were killed. The latter was held down by the engine and scalded to death. A part of the wreck took fire, but was extinguished by the town fire engine. The conductor was injured.

13th, on Chesapeake & Ohio, at Cincinnati, O., a freight train ran over a misplaced switch and was derailed. A signal tower was partially wrecked and the signalman was injured by jumping out.

19th, on West Jersey road, at Bridgeton, N. J., some passenger cars being switched became unmanageable and ran against the station building, doing considerable damage; two trainmen injured.

19th, on Louisville, Evansville & St. Louis, at Boonville, Ind., a passenger train was derailed at a misplaced switch; two trainmen injured.

20th, on West Virginia Central, near Lime Rock, W. Va., a passenger train ran over a hand car and the engine and three cars were derailed and badly damaged. Two men on the hand car were killed.

27th, on Southern Pacific, at Oakland, Cal., a switching engine was derailed and ditched, while making a running switch. One employee and one boy were injured.

31st, on Huntington & Broad Top Mountain Road, near Huntingdon, Pa., a passenger train ran over a misplaced switch and the engine was overturned. The engineer was scalded.

31st, on Pennsylvania road, near Industry, Pa., a passenger train was derailed while running over a crossover track at considerable speed and ran against another passenger train, doing considerable damage. A brakeman was injured.

And 6 others on 6 roads, involving 2 passenger and 4 freight trains.

#### UNFORESEEN OBSTRUCTIONS.

5th, on International & Great Northern, near Taylor, Tex., a passenger train was derailed by running over a cow and the engine was overturned. A man stealing a ride was injured.

7th, on Southern Pacific, near Tamarack, Cal., a freight train was derailed by a landslide and the engine and five cars wrecked. The slide came from a great height and about 300 tons of rock landed on the track. Fifty feet of a snowshed was crushed.

7th, on Great Northern, at Columbia Falls, Mont., a passenger train was derailed by running into a landslide, ditching the locomotive. The engineer was killed and the fireman injured.

8th, on Kanawha & Michigan, at Buffalo, W. Va., a freight train was derailed by running over a cow, and the engine and four cars fell down a bank. The engineer was killed.

10th, on Flint & Pere Marquette, near Ruth, Mich., a passenger train was derailed by cattle lying on the track, and the locomotive was ditched; engineer and fireman injured.

13th, 11 p. m., on Baltimore & Ohio, near North Moun-

tain, W. Va., train No. 46 was derailed by a landslide and the engine and six cars were overturned; engineer and fireman badly injured.

16th, on Southern Pacific, near Delta, Cal., a passenger train was derailed by a rock which had fallen upon the track, injuring the engineer and fireman. The engine fell into the Sacramento River and the first two cars were badly damaged.

21th, 11 p. m., on Norfolk & Western, at Weaver's Bluff, Va., a freight train was derailed by a landslide and the engine and five cars ditched. The engineer was killed.

30th, on South Carolina road, at Ridgeville, S. C., a freight train was derailed by running over a cow, and 14 cars were ditched. The engineer was killed and the fireman injured.

And 15 others on 13 roads, involving 5 passenger and 10 freight and other trains.

#### UNEXPLAINED.

2d, on Rockaway Valley road, near Pottersville, N. J., a heavy engine ran off the track and blocked the road for two days.

4th, on New York Central & Hudson River, near Hyde Park, N. Y., the caboose of a northbound freight train jumped the track and ran against another freight train standing on a side track; one of the cars in the latter train was pushed over so as to foul the southbound main track and a moment afterward was run run into by a passenger train, the engine of which was derailed and fell into the Hudson River. The engineer and fireman were injured, the former having fallen into the water with the engine.

4th, on Chicago, Burlington & Kansas City, at Mendota, Kan., a freight train was derailed by a misplaced switch and several cars ditched. Three trainmen were injured.

7th, on Great Northern, at St. Paul, Minn., a freight train was derailed and the engine and a car of cattle overturned. Two men were injured by the liberated animals.

8th, on Great Northern, near Rock Island, Wash., a passenger train was derailed, making a bad wreck. The engineer was killed.

13th, on Yazoo & Mississippi Valley, near Helm's, Miss., a freight train was derailed and 20 cars ditched. The engineer was injured.

16th, on Wabash road at Nameoki, Ill., passenger train No. 9 was derailed and the whole train went into the ditch, four cars taking fire. The train contained about 200 passengers and was running at good speed. It is said that no person was killed outright, but that about 30 passengers were injured.

20th, on Pennsylvania road, near Pittsburgh, Pa., a car in a freight train was derailed and ran against a freight train on an adjoining track. A brakeman was badly injured.

21st, on Ohio Central, near Corning, O., a freight train was derailed and a brakeman killed.

25th, on Pennsylvania road, at Harrisburg, Pa., a car in a freight train jumped the track at a switch and derailed several others, including part of a westbound train which was passing on the adjoining track. Four tramps were killed.

25th, on Southern Pacific, at Stella, Tex., a car in a fast freight was derailed and ran against the engine of a freight standing on a side track, making a bad wreck. Two tramps were killed and the conductor and 1 tramp injured.

26th, on Chicago Great Western, near Red Rock, Minn., several cars of a mixed train fell through a bridge, making a bad wreck. Three passengers were injured.

And 21 others on 17 roads, involving 4 passenger and 17 freight and other trains.

#### OTHER ACCIDENTS.

7th, night, on Pittsburgh, Fort Wayne & Chicago near Garfield, O., one truck of an empty freight car in a freight train was derailed and ditched, the train passing on and the accident not being discovered until the train stopped at Alliance.

9th, 9 p. m., on Pittsburgh, Fort Wayne & Chicago, near North Lawrence, O., several cars of a freight train were wrecked by the explosion of a carload of powder. The engineer and fireman were badly burned, and two other trainmen and two tramps were injured. The road was blocked about 12 hours.

9th, on Union Pacific, near Hood River, Or., the engine of a freight train was damaged by running into a landslide. Three trainmen were injured by jumping.

15th, on Wisconsin Central, at Chippewa Falls, Wis., a baggage car of a passenger train was burned out by a fire which is said to have started inside while the messenger was asleep. The messenger was badly burned. It is said that the fire started from a lamp.

22d, 3 a. m., on Georgia Pacific, at North Birmingham, Ala., the engine of a freight train was wrecked by the explosion of its boiler and the engineer and fireman killed. The engine had just come out of the shop.

31st, on Fremont, Elkhorn & Missouri Valley, near Stanton, Neb., a car in a freight train was set afire by sparks blown in through the open end doors, and the contents burned so rapidly that three persons inside riding with their household goods and horses jumped out and one of them was killed.

And 6 others on 6 roads, involving 5 passenger trains and 1 freight train.

A summary will be found in another column.

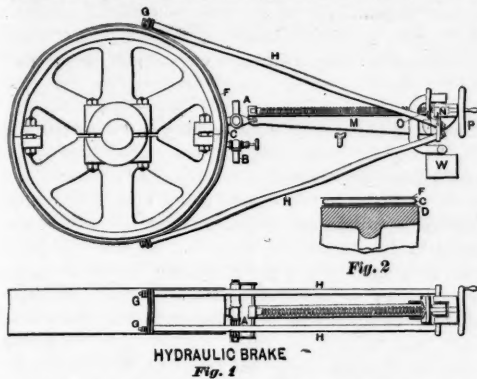
#### New Form of Prony Brake.\*

The brake illustrated was designed by Mr. Carpenter two years ago, and has been in use for a considerable portion of that time. The brake consists of a tube of copper with an elliptical cross-section, figs. 1 and 2 C, which nearly encircles the brake wheel. Outside the copper tube is an adjustable band F of sheet steel which prevents the copper tube from expanding. Water pressure is applied to the copper tube by means of hose connections A and B; the amount of pressure being regulated by throttling the admission and discharge valves. As the external diameter of the copper tube cannot change, the pressure causes the inner surface to rub against the wheel, producing the friction which is used to absorb the work. To prevent the wearing of the inner surface of the copper tube a thin sheet of steel or Russia iron D is inserted between the tube and the brake wheel, and connected to the brake so as not to revolve. This brake has proved very satisfactory.

\* Presented at the New York Meeting of the American Society of Mechanical Engineers, by R. C. Carpenter.



and no trouble has been experienced on long runs from heat or irregular friction of the brake. The first cost is small, the brake not costing over \$50. A self-regulating device is described, and is shown in the cut fig. 1. Previous devices for automatic regulation of the work ab-



sorbed by a brake require the free end of the brake-arm in an upward direction, which is sometimes an element of danger.

The method of securing the adjustment is to have the brakearms *HH* fastened to the end of a horizontal lever *M* by the knife edge *N*. This lever is supported at *O* by a knife edge which is supported by the scales *W*. A movable weight travels on the arm of the lever and gives the required brake load. If the brake load is too great, the pressure at *N* is greater than on *M*, the point *A* of the lever rises and regulates the opening of the supply valves and varies the pressure on the brake.

#### Passenger Cars at the World's Columbian Exposition.

Mr. Geo. Gibbs' paper on the above subject was discussed at considerable length at the November meeting of the Western Railway Club, Mr. Rhodes opening the discussion by a few remarks on the functions and merits of American and foreign draft rigging.

Mr. RHODES: It seems to me, in looking over this foreign equipment, that one of the most striking differences between the European and our equipment is the draft rigging. I heard a prominent master mechanic, in looking over some of the couplings between the engines and tenders, between tenders and coaches and freight cars, almost ridicule the connection between the two vehicles. Now, as a matter of fact, there is a great difference between the two when you look at them at first, but if you look at the rigging and consider only the pulling feature of the rigging and compare these hook connections between the engines and tanks and other equipment with our link you find that there is no difference, that our link connection is just as trivial and just as small as any of the connections on this foreign equipment. The difference is simply this, that the foreign equipment does not perform in its draft rigging the double function that we do in this country. We have—I think very unfortunately—a draft rigging that has to perform two functions. It has to pull and it has to buff. You cannot get up anything which would be so destructive to machinery as just that style of connection. Now, if you look at these foreign exhibits at the World's Fair, you will find that those two functions are separate and distinct. The part which has to do the pulling does pulling alone and nothing else. The part that has to do the buffing does buffing alone and nothing else. I think at the present time there is perhaps nothing more important than a thorough understanding of that simple fact. If you look at the framing under this foreign equipment you will find the draft sills there, but when it comes to the pulling connections, in place of the draft timbers running out to the end sills as we have them, they diverge and go out to the buffer, so that at the end of the car there is practically no center sill at all. With us we are obliged to concentrate everything to the center; not only draft sills, but we have to have intermediate sills, and we get them as close to the center as we can, so as to concentrate our strength in the middle of the car.

They have buffers which take all the blows and all the strains and the draft rigging is not damaged at all. Now, in this country there is nothing more expensive than the maintenance of draft rigging on our freight cars. This question is a live one for Master Mechanics and Master Car Builders to think of, because we have already had to express an opinion in the letter ballot. We were asked to vote for double deadwoods. The motion was lost. It will probably go through another year. It is a thing which will surely come—and a curious thing is that the lines in the East are not supporting this matter the way they ought to. The reason is this, that they have had draft rigging with double deadwoods on their cars in the past, and have had no experience without. Since the introduction of the M. C. R. coupler, however, they have, curiously enough dropped the double deadwoods. They are now going to get experience without the deadwoods, and I think after a year or two that we will find them very glad to adopt some kind of protection to their draft rigging, the same as they had before.

Mr. McILVAINE: If my recollection serves me right, on both the Pullman and the Wagner trains that were on exhibition at the World's Fair were buffers, and I think they were pretty stiff ones—sufficiently stiff to exhaust any buffing strain and relieve the blow on the drawbar. I think they are equally as strong for buffing purposes as the buffers on the foreign cars out near the corners of the car and much better adapted to the purpose, being at the center, or line of resistance.

Mr. BARNES: On page 33, figs. 21 and 22, is shown the use of iron and steel plates to strengthen the cars. It seems to me there is a point that could be discussed with a great deal of profit just now, some means of strengthening cars in collisions. If I remember correctly, in three collisions lately nearly 70 people have lost their lives because the Master Car Builders have permitted cars to run which were unsafe. I have talked with car builders, and they say they no longer build cars that way except on specifications of railroads. Even the specifications of the car builders are better than some

railroad specifications. One car company has a plan by which it puts horizontal plates on a car and prevents splitting. I would like to get an expression of opinion from the members with regard to the justice of putting people in a passenger car with no provision to prevent the car splitting open.

Mr. RHODES: I do not think that the placing of iron plates on draft timbers has been brought about on account of the liability of cars telescoping, but because the draft timbers break so frequently on account of the holes through them that it has been found economy to line them with iron to save them breaking in ordinary service.

I do think the strengthening of the fronts and sides of the cars is a very important matter. In the paper attention is called to one construction as used on the C., B. & Q., termed the Challenger truss. There is no patent on that device, and I do think it is a matter which is worth considerable attention. In that construction there is a heavy plate running throughout the sides of the car. The great advantage of that is that we get the full benefit of the posts without having them cut through by framing and bracing, as is necessary where you do not use that construction. I believe that if some of the Master Car Builders would look at the way they have riddled and cut and put holes through their posts and pillars, they would see that they have practically cut the life out of them. The particular feature of the Challenger truss is that all those posts are made solid and intact without any holes bored through them. The plate is screwed to that and it makes a very strong construction.

I would like to call attention to some points in Mr. Gibbs' paper which I think are worthy of attention, especially at the present time, when it is so evident to every one that the railroads have got to be operated cheaper in the future in order to make ends meet. Mr. Gibbs, I am very glad to say, has criticized the lavishness and expense of some of the equipment in a very free way. It is also interesting to note that an official of a prominent Eastern railroad, who probably never saw this paper at all, has come out boldly in the same way, and said that the expense of some of our equipment is not warranted by the returns the railroads get for it. It is mentioned in this paper, I believe, that some of the equipment, even the smoking car, I believe, is finished in vermilion wood. It seems to me that in future construction, if we have got to operate our railroads cheaper, one way for us to do is to use a cheaper lumber in our equipment.

I think it is interesting to notice on the Canadian Pacific that there is a separation under passenger equipment of the two features of a drawbar, the arrangements for pulling and buffing being entirely separate. Also, that the Canadian equipment had a vestibule the diaphragms of which are made of canvas. I do not know just what the cost of the canvas is, but it must be very cheap compared with rubber. I would advise those who are putting on vestibules to look into this question, and find if they can't use canvas as well as rubber. I think they will find it would cost one dollar to every 10 or 20 it does with rubber.

I should call a strictly non-telescoping car one constructed like the Chicago & Alton, with the Blackstone platform, but if we want to give these other devices those names we can of course do so.

Mr. BARNES: I would like to set myself right in regard to the use of metal plate. I quite agree with Mr. Rhodes that a longitudinal plate is not a non-telescoping device. What I had reference to is a plate such as is shown on page 9, fig. 24, for instance. There is no excuse for not using a piece of steel that will reduce the effect of a collision at least 100 per cent., when the steel would cost four or five dollars and the car is worth \$3,000 or more. The devices which are efficient, as far as I know, are these plates placed transversely, the double floor laid diagonally and the vestibule end. There are plates on the tops of some of these cars and also an angle iron framing for the end. The angle iron framing to prevent that shearing off the top of the car is better than nothing. At present nothing is provided but a very light timber.

President FORSYTH: Mr. Gibbs' paper and the discussion here have emphasized, I think, the elaborate decoration and the sacrifice to luxury which is met in a large number of these cars, and I want to call especial attention to the result. It has resulted in an increase in weight in our American passenger cars to a degree which I think we ought to call a burden, and you will find in this table that some single cars at the World's Fair weigh as much as 114,000 lbs., and numbers of them over 100,000 lbs. The first one I call attention to is a day coach, built by the Pullman company. Seating capacity, 64 people; 60 ft. long; weighs 80,800 lbs., and its weight per passenger is 1,262 lbs.

The next one is a day coach built for the Baltimore & Ohio by the Pullman company. Capacity, 67 passengers; length, 60 ft.; weight, 70,600 lbs., weight per passenger, 1,053 lbs.

The next one is a day coach built for the Pennsylvania road by the Pullman company, weighing 81,900 lbs. Its length is only 54 ft., and its capacity 66 passengers.

The Old Colony has a day coach built by the Pullman company. Capacity, 78 passengers; length, 60 ft. 4 in.; weight, 65,700 lbs.; weight per passenger, 842 lbs. That coach holds a large number of people and its weight per passenger is comparatively light.

Then, without special pride, I want to call attention to the C., B. & Q. coach built by Jackson & Sharp, which has a capacity of 60 passengers; length, 53 ft. weight, 53,500 lbs.; weight per passenger, 891 lbs. Now I will venture to say that that coach is just as strong as any of the others I have mentioned, and yet it is very much lighter.

One reason why some of these coaches weigh so much is because they have under them six wheeled trucks, some of them with large wheels, 36-in. cast iron wheels and 30-in. steel tired wheels. Now I will give the weight of some trucks. A four-wheeled truck, with 33-in. wheels weighs 9,100 lbs.; with 38-in. wheels weighs 10,000 lbs. A six wheeled truck with 33-in. wheels weighs 14,500. Now, if any of the people are here who represent these heavy coaches, I would like to ask them what their object is in putting six-wheeled trucks under coaches. That, it seems to me, as I said in the beginning, is one of the things which the railroad shop people themselves are inflicting upon the locomotive department, and I thoroughly advocate, as strongly as I can, never to build a coach that is so heavy that it will require anything more than a four-wheeled truck.

Secretary STREET: There are two points with regard to the discussion on which I want to say something on the other side, not necessarily because I believe that the views that have been advanced are wrong, but because I think that we should be reminded of the fact that there is another side.

One of these is in regard to the excessive decorations

in the cars. I myself believe that they have been carried to an extreme, but as a justification thereof I think you would find that the passenger agents would all advocate these decorations and also the very expensive woods which Mr. Rhodes speaks of. If a passenger agent can state that a small piece of furniture inside of the car is of some solid, expensive wood he can make a great deal of capital out of it.

As to the weight of the coaches, I thoroughly indorse everything that Mr. Forsyth has said, but I think he did not mention the excessive weight of the coaches on the Empire State Express. I think they are the heaviest in the list, and in considering the excessive weight there, we should give a great deal of credit to the persons who designed these coaches, for the fact that they are put together as strongly as it is possible to construct a coach.

With regard to this construction of the end shown on page 24, I had quite a lengthy conversation with a Master Car Builder who had had coaches so constructed, running on his road for some time, and he told me that he had seen coaches come out of a collision with the end platforms completely stripped from the car and the whole end bent in from 18 in. to 2 ft., showing that without that construction the car would have been literally torn to pieces, while as it was, not a passenger was severely injured.

Mr. PECK: I had occasion once to see a platform pulled off a sleeping car and all that held it to the car was two  $\frac{1}{2}$  bolts. The draft timbers were morticed in and not bolted. When they set a brake there was nothing to hold but the strength of the steps and the whole platform pulled off. You will notice on the sleeper platforms there is not a bolt, although they have great heavy chains to couple by. That was the first time I ever knew there was such poor fastening in the platform of a heavy car.

Mr. HERR: One word in regard to so-called non-telescoping devices. I think while there is no excuse for not taking every measure that can be adopted to strengthen our cars as much as possible, we make it as difficult to break up a car as it possibly can be made, and we should not forget that strong as we make our equipment, there must be something given way when we have a collision. The amount of energy that has to be absorbed there is too great for the spring or buffing gear to take, however strong the balance of the car may be made. I think the true solution of the non-telescoping car is to adopt some form of signals on the road that will make collisions as few and far between as possible. The pace interval seems to be the only reliable expedient.

Mr. WHYTE: Speaking of non telescoping devices, it might be as well to describe the one adopted by the president of one of the large car building companies for use on his private car.

The sills of themselves make a solid floor; they are laid close to each other and tongued together with narrow strips. On top of these are two thicknesses of flooring, each  $\frac{1}{2}$  in. thick and laid diagonally. The sides, except at the windows, are also solid and are somewhat thicker than usual; the usual spaces between framing are filled by vertical pieces similar to the posts. There are three thicknesses of sheathing inside, the middle one extending vertically and the other two lengthwise of the car. There are two thicknesses outside, the outer one placed vertically. This arrangement probably protects this car, but it is hard to say what would happen in case of a collision to ordinary cars in the same train were this one at the rear. It would then probably become a telescoping device. The weight of the car is about 100,000 lbs.

Mr. BARR: The trouble in getting up devices for insuring safety in collision is that when we get into collision the things never behave the way that we figure on. We can build a car with a bottom of solid steel; it will make a nice, heavy battering ram; when it happens to get above the platform of the car ahead of it and the car ahead stops suddenly, it will go right through. You can build the sides of solid steel; if the two cars happen to get a little six inches out of line they are going into each other, and the heavier you make them in cases of that kind the further they will go. I am inclined to think that the excessive weight of cars is a greater threat of danger to us to day, in the matter of collisions, than almost anything else.

#### The Diamond Shoal Lighthouse.

The Government Lighthouse Board is taking steps to resume the bold and hazardous attempt to erect a lighthouse on the outer Diamond Shoal off Cape Hatteras. Several attempts have been made to accomplish this object, but the location is so difficult that they have not been successful. The last attempt was in 1890, when Messrs. Anderson & Barr, of Jersey City, lost \$75,000 to \$100,000 in an unsuccessful attempt to secure foundations.

The Lighthouse Board has now let contracts to make soundings and borings, to ascertain if a solid foundation can be had. This work will be attempted from a metal framework to be built upon the proposed site of the lighthouse. For this metal staging the contract has been awarded to the Weimer Machine Works, of Lebanon, Pa., for the sum of \$2,700. The contract for pontoons to carry this to Cape Hatteras has been awarded to Sanford & Brooks, of Baltimore, at \$1,175. Many engineers think that making these soundings or borings is a needless waste of time and money. The geological formation of the coast for a great distance out to sea and back into the land is well known. It is a great sandbank, of such depth that it is impossible to sink a structure to bedrock. The only utility of the borings would be to ascertain if there was a wreck or similar obstacle in the underlying strata, for the heavy seas would preclude the possibility of locating a caisson at any definite spot, at least within the limits of a wreck or stray boulder. The work can be carried on only during the four summer months of each year, and during only 10 or 15 days of each month, not enough to complete a work or to get it in such shape as to resist the violent storms of the fall and winter. The opinion has been freely expressed among both civil and military engineers that the project of erecting a lighthouse at this point is not feasible.





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#### EDITORIAL ANNOUNCEMENTS

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Though not technically correct in our report that the Pennsylvania and Maryland steel companies had leased their plants, we were correct in our belief that the mills of these companies have passed under the control of the other steel rail manufacturers of the Association; the difference being that existing between a lease and a contract. A search of the Court records by the *Iron Age* reveals the fact that the Maryland Steel Company has accepted an offer for 300,000 tons of rails, and the Pennsylvania Steel Company an offer for 100,000 tons at \$25 a ton. The purchasers give bonds for the payment of \$300,000 to the Maryland Steel Company and of \$80,000 to the Pennsylvania company, to receive the rails during the year 1894. The sellers are to accept no other orders for this class of rails until these lots have been taken. The Maryland and Pennsylvania companies get the business or the forfeits of \$300,000 and \$80,000 respectively. It will require the language of a legal document or the refinement of a Court's opinion to discriminate between this arrangement and a lease at an annual rent of \$300,000 and \$80,000 for the two mills. The names of the parties that gave the bonds are not given, but as the *Iron Age* puts it, people may guess who the buyers are.

#### The Hudson River Bridge.

The New York Chamber of Commerce has passed resolutions in opposition to the bill now before Congress permitting the construction of the New York & New Jersey bridge across the Hudson River, and has sent a committee to Washington to fight the matter. The resolutions of the Chamber say that a pier in the river will be an obstruction to the commerce of the port and an injury to the entire country, particularly to the great West, whose products find an outlet through the Erie Canal and the Hudson River. The Maritime Association of New York has issued a pamphlet also opposing the bridge on the same ground. This association says that a pier would be a constant source of peril; that if it were a natural rock the city would not rest until it was removed, and that it would tend to create a shoal in its neighborhood; moreover, that it is unnecessary to put a pier in the river except to save private citizens the cost of a bridge of longer span without a pier.

To this the New York *Times* replies that a bridge with a span the entire width of the river would cost so much that it is doubtful if capital would venture upon its construction. The proposed span would leave a deep and unobstructed channel wider than the whole river throughout most of its navigable length, and the main span 500 ft. wider and 15 ft. higher than the East River bridge, which crosses above a navigation far greater than that on the Hudson River. It says that the comparison of such a pier with a mass of hidden rocks is absurd, and suggests that if there had been a safe channel, even of 1,000 ft., the Heli Gate rock would never have been disturbed. Allowing a pier in the river makes the undertaking financially feasible. The *Evening Post* of New York thinks that the action of the Chamber of Commerce in being led away by ship and steamboat owners in sur-

Mr. T. C. Clarke, the Chief Engineer of the New York & New Jersey Bridge Company, in a letter to the *Times* explains the principal reasons which led to locating the bridge at Seventy-first street and to the determination of its length of spans. The height of 150 ft. above water was fixed by the United States engineers, and it did not seem advisable to reduce this, as the height of the bluffs at each side permitted approaches with grades not over 45 ft. to the mile, and the right of way necessary for the approaches could be got in this part of the city without prohibitory cost. The length of spans, 2,000 ft. clear for the central span and 900 ft. for each of the flanking spans, was such that a cantilever bridge could be built without introducing any new or untried features. Objections to a pier in the river at Twenty-eighth street do not apply to the location at Seventy-first, and the possible use of a pier would reduce the cost of the New York & New Jersey bridge to something like 40 million dollars below that of the rival scheme at Twenty-eighth street, which has no pier. This would save a perpetual tax on commerce equal to the interest on that sum. It is estimated that there is business enough in sight from through passengers, not counting suburban passengers or freight, to pay fixed charges on the bridge of less cost, while there is not business enough to pay interest on a bridge that would cost 80 millions or more.

To this there seems to be little to add except to emphasize the points that the saving of the interest charge of, say, two million dollars a year, on all traffic over the bridge as long as the bridge stands, is vital, and that the question is not between a 40-million dollar bridge and an 80-million dollar bridge, but between a 40 million dollar bridge and no bridge. We are not satisfied, indeed, that there is revenue enough in sight to pay interest on the cheaper bridge, but we are very well satisfied that there is not enough possible revenue to pay interest on the more costly one. It has always seemed clear that the suburban passenger business over a Hudson River bridge would be very little, and that the freight business would be quite insignificant compared with the fixed charges. The traffic of both these classes is distributed so conveniently by water, and so cheaply and satisfactorily, that it is not supposable that it would ever be diverted by a bridge to some point well up town and thence distributed by means of distribution which do not yet exist. We believe that even Mr. Luddenthal concedes this, in the main at least. There remain then the through passenger traffic and the small amount of high-class merchandise freight from which the bridge must draw its revenues, and much careful consideration of the matter long ago led us to the conclusion that these elements could not possibly pay fixed charges on a bridge costing 80 or 100 millions. Thus we come back to the proposition that the question is between a possible bridge and a bridge which cannot be financed.

#### Preventing Railroad Accidents by Law.

The comments of the daily newspapers on the startling series of collisions that has occurred this fall have in many cases ended up with a demand for legislation to prevent such disasters in the future; and in those legislatures which sit the coming winter we shall probably see presented an unusual number of bills designed to accomplish this result. These demands of the press have not generally been of the rash sort that used to be common. The difficulty of regulating the details of railroad operations by statute seems to be recognized by our best newspapers, and bills like that recently presented in Congress by a Populist representative, which aims at nothing less than the entire abolition of "over work and underpay" on railroads, are no longer commended; but there is, nevertheless, a demand that the law shall do something.

It will be worth while, to take a moment to inquire what the legislatures can do for us. Every one, railroad officers and the public, desires, of course, to stop the harvest of suffering and death; no one is content to accept the explanation that the World's Fair rush was the whole cause, for the railroads have killed 150 passengers a year for the past five years, and the law of averages does not afford much comfort. But, judging by the past, the legislatures cannot do much. Even those laws which are designed to curtail railroad profits are generally put together in a bungling manner and are made effective only after numerous experiments; and measures affecting technical details of operation are still less satisfactory to their friends. Cutting down rates or raising taxes is child's play compared with preventing collisions, or even with attempting to do this indirectly by "stamping out the evil of under pay." Most of the measures that have been proposed of late years to regulate mechani-

cal or administrative details have had their weakness exposed by discussion and have not got so far as to be enacted into law; but of those that have been passed how many have done any good? We recall little definite improvement in operating methods anywhere which has come from legislative action. The most notable recent instance of this kind of legislation, the National car-coupler law, was finally reduced to a simple recognition by law of what the railroads were doing voluntarily. State legislation which went on for years was vain, for the mechanical conditions were too complicated to be solved that way. The automatic couplers brought out under the stimulus of the laws had to be thrown away and not even the germ of one of them has survived in the M. C. B. coupler now adopted. On the other hand state laws have been of use in getting grade crossings protected by interlocked signals, for this is a simple matter. In the matter of heating cars also state laws have done some good, but at considerable cost to the railroads in waste labor and material, the matter not having been worked out mechanically before the laws took effect. And this about sums up the practical results of a great deal of special safety legislation.

One of the demands now being voiced in various quarters is that the legislatures shall remove the \$5,000 limit, so that the heirs of persons killed can recover larger sums from the railroads. Such a change in the law would probably do little harm, except to fatten the shyster lawyers, but it is not likely it would do any good in the way of preventing fatal accidents. The railroads already have a serious financial argument impelling them to run trains safely, and increasing the amount recoverable for deaths would not enhance its importance materially.

The legislatures cannot effect any improvement by altering the laws concerning imprisonment of negligent officers and employees, for these are stringent already. This remedy is thus far futile, and perhaps must continue to be so, for the guilt is almost always divided between different individuals in such a way that the juries, being unable to fairly apportion it, let all go free. A reckless engineman gets off because some officer knowingly tolerated his recklessness, and directors are not condemned to ride on the cowcatcher because they are only partly to blame.

Legislation to regulate hours of work has not yet made much headway in this country, but we can see from the experience of England what a difficult question it is. We cannot touch it without at once interfering with freedom of contract, a fundamental constitutional right. In England the evil of long hours is probably in many respects worse than it is here, and legislative interference would be more justifiable; but the most that the friends of the laborer have been able to do there, after a long discussion in Parliament, is to pass a law which exerts what may be called a remote pressure on the companies. The Board of Trade may order work-time schedules, which will probably bring the actual hours of work within reasonable bounds, but there is no penalty for non-compliance until another and higher board, the Railway Commission, has also gone over the matter. The persuasive process is very thoroughly tried before compulsion is resorted to.

And this brings us to what we deem the most hopeful aspect of our present problem, from the public standpoint, the efficacy of persuasion where specific laws are useless. Persuasion is potent, and it can be made use of without straining well settled principles of law or disturbing traditions. Persuasion in this matter is simply the process, kept up constantly and intelligently, of showing dilatory, shortsighted or careless railroads what the prompt, wise and careful ones are doing, coupled with clear and reasonable statements of the bad or questionable practices which ought to be abandoned in favor of better methods.

Persuasion is the means by which state control of railroad operation has been made most effective heretofore. Massachusetts has been more successful in this than any other state, and her Commission has no compulsory powers except in a few minor matters. The government of Great Britain has had a good deal of influence on the railroads of that country; but in technical matters, at least, it has been almost wholly by means of the intelligent persuasion of the Board of Trade. The power of the Board of Trade and of the Massachusetts Commission has been due chiefly to the high ability and integrity of their members. The weakness of some of our state commissions has been due largely to the absence of ability—that is, of a thorough knowledge of the details of railroad operation. This knowledge is the first requisite in a state railroad commissioner who attempts to prevent accidents and promote safety, for the questions on this subject in which he should advise a railroad manager are often



difficult for even the best judges to decide; and the second requisite, integrity of personal character, is of equal importance, for decisions on such evenly balanced questions carry no weight unless they are backed up by a strong character.

A man of character and ability can tell Manager X how Manager A has succeeded in introducing the block system five years in advance of his neighbors, and the hint will stand a chance of being effective; he can tell Y how B has persuaded his directors that the quality of the signalmen needed to be elevated to the extent of \$5 a month, and he can show Z how C finds satisfaction in keeping a dozen spare passenger engineers where Z thinks he can afford to keep only half a dozen. He will judiciously give publicity to his arguments when they go too long unheeded. It is such points as these which go to make up safety, but which a specific statute cannot be made to reach.

Regulation by commission is effective where regulation by specific legislative enactment is impossible but even with the commission system there are difficulties inherent in our separate state jurisdictions. Our lessons must be drawn from the most marked contrasts between good practice and bad; but these are not generally available, in an effective way, in a single state. Of accidents, for instance, the worst are scattered here and there all over the Union. It would be possible, with a sufficient appropriation, for the Massachusetts Railroad Commissioners to get valuable lessons from collisions in Illinois or Mississippi and publish them at home, and the other states could enjoy the benefit of them; but it would be a radical innovation, and often the most desirable information could not be got at. The Milwaukee *Sentinel*, in an unusually intelligent article on the recent disasters, asks for an Interstate Inspection Service. The Interstate Commerce Commission has already gathered statistics of accidents, but there are many features of railroad operation needing investigation which, we think, would be decided, if taken before the Courts, to be matters of police regulation, and, therefore, not subject to Federal laws. Perhaps the railroads would not take them before the Courts, but some state officer might be jealous enough to do so if a National officer trod on his toes. It would certainly be much better, though, to have one well qualified inspector for 44 states than 44 mediocre inspectors; and inadequate appropriations, making the appointment of the highest grade of men out of the question, constitute one of the principal defects in our present railroad commission laws. Where a capable man takes such an office he does it from motives of public spirit or something else besides stern "business," and does not enlist for life as do the British inspecting officers.

#### Some Facts About Counterbalancing Locomotives.

In another column will be found an account of some important experiments made at Purdue University in the matter of counterbalancing locomotives. The results show that the locomotive drivers in this installation lift from their bearings on the friction wheels at speeds as low as 40 miles an hour, and at 60 miles an hour the wheel is off the bearing during an angle of revolution of 55 deg. The greatest lift was not measured. It may have been as much as a quarter of an inch. As near as could be determined the angle of revolution, from the time the wheel commenced to lift to the point where it practically returned to the rail, was about 180 degs. The dropping of the wheel was more rapid than the rising, as might be expected, from the fact that the wheel lifts against the force of gravity and the force of the locomotive carrying spring, and when it drops these forces act to accelerate the downward movement.

The results of the tests correspond with the theory of the action of revolving bodies and corroborate the exceedingly limited amount of mathematical analysis that has been made of this subject up to this time. The matter has long been a neglected one and no one has taken the trouble to make such mathematical investigations as are necessary to guide an experimental investigation into this subject, although the matter has been suggested many times in these columns.\*

The practical bearing of all this is very great; civil engineers have long contended that high-speed locomotives are injuring the track, and this they have proved by practical examples before referred to in the *Railroad Gazette*, and of which the following is a synopsis: In one case two miles of track were badly damaged by running a comparatively light eight-wheel locomotive down hill at a speed of 70 miles an hour, the driving wheels being wrongly counter-

balanced because of an error in reading a drawing which was sent to the repair shops of a railroad company. Overbalance resulting from error in calculation caused, in another instance, serious damage to considerable track. In another case some locomotives sent to a foreign country injured a large amount of track before the particular locomotive which had the bad counterbalance could be selected from the others which were more properly counterbalanced. In still another case a consolidation locomotive which was run at a high speed with the side rods removed (this gave an excess of counterbalance) damaged so much permanent way that an order was issued requiring that locomotives with the rods disconnected should never be run at a speed exceeding 10 miles an hour. As the large majority of the locomotives shipped by locomotive builders to different parts of the country are disconnected when hauled there is no doubt that much of damaged track results from running overbalanced dead engines at speeds of 25 miles an hour and upward. In all the foregoing cases the effect on the track was a vertical and horizontal bending of the rails. In one case where the bending was measured the rails were found to have a permanent set of about half an inch, the distance between the bent spots corresponding very closely to the circumference of the drivers.

All this shows the important bearing which these experiments made at Purdue have on counterbalancing of locomotives and the practical maintenance of track. This is the sort of investigation that ought to be taken up by the Master Mechanics' Association and the American Society of Mechanical Engineers, and, perhaps most of all, by the American Society of Civil Engineers, as the members of that society are more interested and directly connected with railroad track than the members of the other two associations. The American Society of Civil Engineers has already done some preliminary work, and attention was called to the importance of the subject by a paper on "The Distinctive Features and Advantages of American Locomotive Practice" before the Civil Engineering Section of the World's Engineering Congress, an extract from which is given in another column.

Railroad mechanical engineering ought to be an attractive branch to the American Society of Mechanical Engineers, as the steam power generated by locomotives exceeds greatly the sum of all of the other power plants operated in this country, and the details of locomotive designing require more technical knowledge and a higher degree of intelligence than is needed for any other branch of engineering pertaining to machinery, excepting, of course, marine mechanical engineering, which is probably the most exacting of all.

The mathematics of locomotive counterbalancing are somewhat involved when all the conditions are fully considered, but the problem is not very difficult if the non-essential and minor factors are disregarded. The problem is not unlike that of the mathematical solution of the action of the Stephenson link motion, in the solution of which many small factors have to be dropped before a practical solution can be reached, and even when this is done the final limited formulae are almost too complicated to handle in ordinary work. The conditions which govern counterbalancing and the effect on the track by locomotives are somewhat as follows.

The locomotive driving wheel must be considered as a body revolving on a center of revolution which is not the center of gravity. The body is held not firmly, but flexibly. Above the body is a driving spring, which, for all purposes of practical investigation, may be assumed to be a perfectly elastic body, having little weight compared to the mass of the wheel which it controls. Below the wheel is the track, which has less total elastic movement than the spring above, yet which may be assumed to be a perfectly elastic body within the limits in which it is moved vertically by the driving wheel. Fore and aft, horizontally, the mass of the driving wheel is held by the jaws of the locomotive frame in such a way that little, if any, movement is possible without a corresponding movement of the whole mass of the locomotive. However, this last condition is not of special moment for the reason that in a fully balanced locomotive the inertia of the reciprocating parts almost exactly, and directly opposes and counterbalances the centrifugal tendency of the revolving driving wheel. This last statement would be exactly true if it were not for the angularity of the connecting rod, but for all practical purposes of preliminary mathematical investigations it may be considered that the revolving mass of the driving wheel, although revolving on a center outside of a center of gravity, has little if any horizontal tendency that is not completely counteracted. The mass of the

driving wheel is then free to move vertically against elastic resistances and is held from horizontal movement. The problem then is, with a known weight of driver and counterbalance and with a given speed and strength of spring above the wheel, how far will the wheel rise from the track, also what will be the pressure on the track, with a given deflection of rail?

An experiment made by the late Mr. Arthur T. Woods at the Champaign University for Mr. D. L. Barnes in 1891 (see *Railroad Gazette*, 1891, page 560) showed very conclusively that the path described by the center of gravity of a locomotive driver is not a circle, when referred to the center of rotation, but it approaches very nearly to an ellipse with the major axis vertical. This much we apparently know; to finish the investigation is certainly worth the time required, to any student, for a graduating thesis. It will be best, however, not to try to consider all of the variables, but to gain mathematical results that are approximately true, and express them in a form that will be useful to engineers.

It may be well to add what are the lines to follow to reduce the effect of the counterbalances on the rail, and also to say that the other drivers will generally lift more than the main driver when the engine is running with steam, owing to the fact that the steam pressure on the crank holds the wheel down unless the engine is running backward.

The effect on the rails is reduced by low speeds, large diameter of drivers, light reciprocating parts (pistons, cross heads, piston rods and connecting rods), heavy driving wheels and elastic track. The effect on the rails is increased by high speeds, small drivers, heavy reciprocating parts, light driving wheels and rigid track.

The effect is greater in winter than in summer, as the track is less elastic and is worse on bridges than on roadbed generally. The conditions, dimensions and weights of parts selected by master mechanics and locomotive builders in this country are such as to make the effect on the track, as a rule, more than double what it need be. An important conclusion is, however, that to bring the counterbalance effect well within a bearable limit, and to reduce it to practical insignificance with the present heavy rails, nothing more is required than a modification of the minor details of our present locomotive. No radical change in design would give better results from a practical standpoint, and it is absolutely unnecessary to resort to engines with more than two cranks, such as have been proposed by the advocates of the Shaw and Strong types of locomotives.

#### October Accidents.

Our record of train accidents in October, given in this number, includes 132 collisions, 116 derailments and 12 other accidents, a total of 260 accidents, in which 97 persons were killed and 328 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	But-ting.	Crossing, and other.	Total.
Trains breaking in two.....	17	0	0	17
Misplaced switch.....	5	3	2	10
Failure to give or observe signal.....	7	1	4	12
Mistake in giving or understanding orders.....	0	7	1	8
Miscellaneous.....	12	2	16	30
Unexplained.....	19	8	23	50
Total.....	90	21	51	132
DERAILMENTS:				
Broken rail.....	4			4
Loose or spread rail.....	1			1
Defective bridge.....	1			1
Defective switch.....	2			2
Defective frog.....	2			2
Bad track.....	1			1
Unsubstantial roadbed.....	1			1
Broken wheel.....	6			6
Broken axle.....	14			14
Broken truck.....	4			4
Fallen brakeman.....	1			1
Failure of drawbar.....	5			5
Broken car.....	1			1
Bent axle.....	1			1
Boiler explosion.....	1			1
OTHER ACCIDENTS:				
Boiler explosion.....			1	1
Cylinder explosion.....			1	1
Cars burned while running.....			4	4
Various breakages of rolling stock.....			3	3
Other causes.....			3	3
Total number of accidents.....				260

A general classification shows:

Defects of road.....	Col-lisions.	Derail-ments.	Other acc'd'ts.	Total.	P.c.
Defects of equipment.....	17	31	5	53	21
Negligence in operating.....	60	15	4	79	30
Unforeseen obstructions.....	0	23	3	26	10
Unexplained.....	55	33	0	88	34
Total.....	132	116	12	260	100
The number of trains involved is as follows:					
Passenger.....	Col-lisions.	Derail-ments.	Other acc'd'ts.	Total.	
Freight and other.....	51	42	6	99	
	191	82	6	279	
Total.....	242	124	12	378	

\*See *Railroad Gazette*, 1889, pages 62, 214, 303, 335, 471, 519, 526, 549, 556, 590, 655, 683 and 691; 1890, pages 189, 199, 225, 235, 282, 378, 482, 536 and 542; 1891, 162, 216 and 540.



The casualties may be divided as follows:

	Col- lisions.	Derail- ments.	Other accidents.	Total.
<b>KILLED:</b>				
Employees.....	28	15	2	45
Passengers.....	41	0	1	42
Others.....	1	9	0	10
<b>Total.....</b>	<b>70</b>	<b>24</b>	<b>3</b>	<b>97</b>
<b>INJURED:</b>				
Employees.....	89	42	8	140
Passengers.....	93	73	0	166
Others.....	5	15	2	22
<b>Total.....</b>	<b>187</b>	<b>131</b>	<b>10</b>	<b>328</b>

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road.....	0	37	4	4
Defects of equipment.....	0	3	3	14
Negligence in operating.....	42	93	30	99
Enforcemen obstructions and maliciousness.....	0	0	6	15
Unexplained.....	0	33	2	8
<b>Total.....</b>	<b>42</b>	<b>166</b>	<b>45</b>	<b>140</b>

Forty-three accidents caused the death of one or more persons each, and 66 caused injury but not death, leaving 151 (58 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with October of the previous five years shows:

	1893.	1892.	1891.	1890.	1889.	1888.
Collisions.....	132	96	120	152	112	82
Derailments.....	116	94	91	115	70	58
Other accidents.....	12	6	13	16	8	6
<b>Total.....</b>	<b>260</b>	<b>196</b>	<b>224</b>	<b>283</b>	<b>190</b>	<b>146</b>
Employees killed.....	45	47	42	71	43	45
Others.....	52	15	16	17	8	75
Employees injured.....	140	83	100	204	133	120
Others.....	188	79	79	176	91	103
Passenger trains involved.....	99	62	67	97	73	54

Average per day:

	1893.	1892.	1891.	1890.	1889.	1888.
Accidents.....	8.39	6.32	7.23	9.33	6.13	4.71
Killed.....	3.13	2.00	1.87	2.84	1.65	3.87
Injured.....	1.06	5.23	5.77	12.26	7.23	7.19

Average per accident:

	1893.	1892.	1891.	1890.	1889.	1888.
Killed.....	0.373	0.316	0.259	0.311	0.268	0.821
Injured.....	1.261	0.827	0.799	1.343	1.179	1.527

The worst accidents in October, those at Nichols, Mich., on the 20th, and at Jackson, Mich., on the 13th, have already been discussed at length in the *Railroad Gazette*. In the Nichols case the coroner's jury held the conductor and engineer of the eastbound train guilty of criminal negligence and exonerated the road from blame. According to the press dispatches the verdict found that it "had furnished first class cars and all the latest improvements for safety."

The other accidents in which passengers were killed were at Clarksburgh, W. Va., on the 20th, and at Stanton, Neb., on the 31st, but in neither of these cases was the passenger riding in a regular passenger train. The Clarksburgh case, wherein a slow train was overtaken on an ascending grade by a much lighter train which was able to run a great deal faster, affords an illustration of a danger which is often overlooked in locating fixed signals. We refer to the very general tendency among railroad officers to assume that on steep ascending grades all trains will be run at very low speed, or, as is often practically decided, if we may judge by the location of the signals, under complete control. It requires little reflection, however, to see that, if we are to provide for light trains and empty engines, and if it is desired to make a railroad suitable for running all trains at the best attainable speed, signals should allow a liberal distance to stop in even on the most unfavorable grades.

The Stanton case is an illustration of a kind which occurs every few months—of the needless risk that is run when passengers are carried in freight trains. The number of persons—men in charge of horses and of perishable freight in cold weather, etc.—who ride in freight cars is very considerable, and, as every one knows, these men cannot be expected to be familiar with the best means of stopping trains or of getting out of the cars in case of danger. This being the case, why not take the simple precaution of running a bell rope over the train or of requiring the passengers to ride in the caboose most of the time?

Other serious passenger train accidents were at Nameoki, Ill., on the 16th; at Wellsville, O., on the 17th; at Lawrence, N. J., on the 25th; and near Effingham, Ill., on the 24th. In this last case, according to press reports, Engineer Morgan, acting for the Illinois Railroad & Warehouse Commission, finds that the train was running dangerously fast, in view of the bad condition of the track, and this criticism of the track had been conveyed to the railroad company in a formal document from the Railroad Commission several months ago.

Near Chippewa Falls, Wis., on the 15th, a mail car was destroyed by a fire which is said to have caught from a lamp, and on the same night a sleeping car standing at the Union passenger station in Birmingham, Ala., was burned out by fire which was started by a lamp explosion. There were some passengers in the car, who escaped without injury. A serious freight wreck near North Lawrence, O., on the 9th, was caused by the explosion of 200 kegs of powder in one of the cars, and the reports indicate that no reason for the explosion has been discovered. Near Hazleton, Pa., on the 22d, a freight conductor who was very sleepy, owing, it is said, to having been on duty about 25 hours, sat in his caboose and slept while he took a runaway ride for several miles down a steep grade at breakneck speed. The caboose was stopped in safety on an ascending grade.

In Cincinnati, on the 18th, an electric street car was struck by a fast passenger train and the motorman killed and 6 passengers injured. In Chicago, on the 7th,

there was a similar collision, the street car carrying about 20 passengers, but they all escaped. In Ashland, Pa., on the 23d, there was another case of the same kind; and another at Houston, Tex., on the 25th. In Chicago, on the 12th, a collision between cable cars and horse cars resulted in the serious injury of several passengers, and on the 19th a cable car collision, due to a grip catching in a loose strand of the cable, caused considerable damage and derailed 9 cars; 200 passengers were badly frightened, but only a few were injured. On the 23d, a collision between a horse car and an electric car injured 7 persons in that city, one fatally.

#### Annual Reports.

*New York, Lake Erie & Western.*—This report is for the fiscal year ending Sept. 30, 1893, and covers about two months of the receivership. The general results of operation are:

	Gross Earnings:	Inc. or Dec.
General freight.....	\$14,461,339	D. 9.9
Coal.....	8,158,137	D. 0.8
Passengers.....	6,107,799	I. 6.8
Mails.....	317,021	I. 10.6
Express.....	508,031	I. 4.5
Miscellaneous.....	440,813	D. 4.0
<b>Total.....</b>	<b>\$29,993,160</b>	<b>I. 0.9</b>
Less due leased lines working on per- centage basis.....	2,632,534	D. 4.5
Balance to Erie Co.....	\$27,340,626	D. 6.1
Operating expenses.....	20,147,778	I. 0.3
<b>Net earnings.....</b>	<b>\$7,928,8</b>	<b>I. 2.0</b>
Other income.....	1,013,909	I. 25.1
<b>Fixed charges.....</b>	<b>\$8,236,737</b>	<b>D. 2.0</b>
<b>Surplus.....</b>	<b>7,319,319</b>	<b>I. 25.1</b>

The distribution of gains and losses on the Erie proper and the New York, Pennsylvania & Ohio is shown in the following table, showing the percentage of increase or decrease of each item:

	Erie.	N. Y., P. & O.
General freight.....	D. 13.07	D. 2.31
Coal.....	D. 1.53	D. 5.55
Passengers.....	I. 4.90	I. 12.05
Mails.....	I. 2.15	I. 16.46
Express.....	I. 12.61	I. 17.21
Miscellaneous.....	D. 5.43	D. 2.59
<b>Total.....</b>	<b>D. 5.98</b>	<b>I. 2.35</b>
Operating expenses.....	D. 7.61	D. 1.79
Net from operation.....	D. 2.70	I. 14.87
Percentage of oper. expenses.....	65.57	72.08

It will be noticed that the effect of the hard times is seen in the freight earnings and of the World's Fair in the passenger earnings. Naturally this last must effect the N. Y., P. & O. much more than the Erie proper. Notwithstanding the greater passenger movement the item of conducting transportation was reduced 8.09 per cent. on the Erie and increased but 2.25 per cent. on the N. Y., P. & O. And it is probable that the system as a whole made money out of the World's Fair passenger business, for it had no accidents and it carried an enormous excursion business with great success. This we look on as one of the notable triumphs of administration of the summer. It was partly due to the wisdom of the managing officers in block signaling the entire line from New York to Chicago, and partly to a good state of discipline and an excellent spirit among the men. Especial effort was made to have the subordinate officers and employees feel that safety was the first object, and that delays were not the worst things that could happen. The result of all was that there were no costly accidents, and we believe no more delayed trains than any one else had. Another result, and a great one, is more self-respect among the officers and men, and more confidence in themselves and in each other.

We have spoken of the decrease in the item of cost of transportation on the Erie proper, and the small increase on the N. Y., P. & O., and yet the passenger miles increased 4 per cent. on the first and 14.6 per cent. on the last; that is, they were 294,544,837 on the Erie, and 93,893,357 on the N. Y., P. & O. But the ton miles fell 13.87 per cent., to 2,599 million on the Erie, and 2.3 per cent., to 953 million on the N. Y., P. & O. The item of motive power expense fell 1.7 per cent. on the Erie and 4.97 on the N. Y., P. & O.

On the Erie proper the great saving in operating expenses was in two items, viz., \$349,923, or 14.59 per cent. in maintenance of way and \$236,741, or 13.49 per cent. in maintenance of cars, which is probably bad for the property, for no such saving could have been made under normal conditions. On the N. Y., P. & O. these savings were much smaller, viz., 5.57 and 4.77.

On the Erie proper the general freight ton-miles fell off 14.33 per cent. to 1,431 million, and the coal ton-miles 13.26 per cent. to 1,118 million. The ton-mile rate on each increased, however; that is, from 0.632 cent to 0.692 cent for general freight; and from 0.551 to 0.627 for coal.

The fiscal year includes all but the last month of the World's Fair, and it is interesting to observe the effects on the passenger earnings. The increase on the system and on each of its two principal parts, in percentages, was—

System.	Erie.	N. Y., P. & O.
6.8	5.27	12.64

The changes in movement are given above. The rate per passenger-mile was 1.496 cent in 1892 and 1.509 in 1893 on the Erie; 1.812 cent in 1892 and 1.770 cent in 1893 on the N. Y., P. & O. The average haul increased but 1.28 per cent. on the Erie and 21.43 per cent. on the N. Y., P. & O. That is to say, the effect on the Erie proper was very little, because, after all, the great passenger

movement was confined to a zone which hardly took in Salamanca. The effect was to raise average rates, for even the excursion rates were higher than the commutation rates about New York. On the N. Y., P. & O., however, the conditions were quite different. The relative increase of the movement was much greater and there were no very low local rates to offset the excursion fares.

The report is almost entirely statistical, and there is but the briefest allusion to the affairs of the company; but naturally there is a reminder that the fixed charges must be reduced and provision made for getting money to apply to betterments, and that the N. Y., P. & O. lease must be modified before the property can be reorganized and stay reorganized. All this is obvious.

The remarkably short time required to load or unload passenger cars which have doors at the side, as compared with the time required with ordinary American cars, has been shown in a striking manner by some memoranda taken by officers of the Illinois Central at the Van Buren street terminus of that road in Chicago during the World's Fair. As our readers will remember, special platforms, about 20 ft. wide, were built at that point, between the main line of the road and Lake Michigan, and the station thus formed was used exclusively for the special express trains that were run between the city and Jackson Park. These platforms were of the same height as the floors of the cars, and passengers from the street entered the platforms at one end, the same as in an ordinary head-house station. The trains consisted of eight cars, all fitted with transverse seats, with an entrance for each two seats, on the same general plan as that which is common in England, and each car had seats for 110 persons. One day during the ordinary traffic to the Fair—not when there was a great rush, like that of Chicago Day—a record was taken and it was found that a train was filled in 10 seconds after it came to a stop. In another case an inward train was unloaded and backed out so as to clear the track in 55 seconds, and at the end of this time the passengers had all left the platform for the street, with the exception of a half dozen stragglers. Vice-President Harahan has sent to his friends an album of handsome photographs, taken at the proper moment, showing first the crowd and then the cleared platform, and illustrating very clearly the facts which we have just outlined. Another photograph shows the crowd on an inward platform 11 seconds after the arrival of the train.

The business situation, while slowly improving, has not gained with such rapidity as seemed probable when the silver purchase clause was repealed. Nevertheless, most of us notice a steady advance. Some significant notes appear in the last issue of *Bradstreet's*. That journal collects over two columns of items concerning the opening or closing of works, increase or reduction of time and changes in wages. An examination of these notes shows 43 items announcing resumption of work in mills of many different classes, as against 15 items announcing suspension of work. This seems to us very significant.

General O. M. Poe has made up his annual report of the traffic through the Soo Canal. The registered net tonnage passing, and other items, for four years are shown below:

	1890.	1891.	1892.	1893.
Number of vessels.....	10,557	10,191	12,580	11,334
Net tonnage.....	8,454,435	8,400,685	10,617,203	9,849,754
Days of navigation.....	228	225	223	219

The number of steamers was 8,379, of sailing vessels 2,955 and 674 unregistered craft. The freight carried was 10,696,522 net tons, as compared with 11,114,283 tons in 1892. There were 7,027 fewer passengers this season than in the preceding year. Gains were made in coal, flour and all other grains than wheat, ores of copper and silver and lumber; all other freights show a decrease.

#### NEW PUBLICATIONS.

*Annual Report of the Board of Health of Massachusetts for 1892.* Pages VII. + 787.

The reputation of the State of Massachusetts for the excellent work and complete reports of her State Board of Health is maintained by the publication of this volume. It embodies an exhaustive report (of 560 pages) of the investigations of the purity of inland waters by experts employed by the Board for that purpose. This includes reports upon the examination of water supplies and of rivers; studies of the odors, amount of oxygen, minerals and microscopic organisms in waters; and reports of experiments upon purification of water by sand and gravel filtration, disposal and purification of sewage; advice to cities and towns as to their water supply, sewerage and sewage disposal and pollution of streams, and a summary of water supply statistics. There are also reports upon artificial ice-making, food and drug inspection, epidemic and mortality of cities and towns and their general health. What will be of special interest to railroad men in these reports are the technical examinations of the streams and their waters, which report takes up 559 of the 787 pages of the book.

The *International Ticket Agent* is the title of a monthly journal which has been started at Philadelphia by C. G. Cadwallader, Secretary of the International Association of Ticket Agents, and Charles W. Strine, the latter being the editor. The periodical is fathered by the Association named, and "will seek an amount of



advertising only sufficient to cover the expense of issue." The first two numbers contain portraits and sketches of Presidents Roberts and Depew, a condensation of the *Official Guide's* list of state commissions and railroad associations, and a dozen pages of miscellaneous railroad matter.

#### TRADE CATALOGUES.

*Illustrated Catalogue of Railway & Machinists' Tools and Supplies.* Manning, Maxwell & Moore, New York and Chicago, January, 1893.

This is certainly the most remarkable trade catalogue that comes under our notice. It is a volume of over 1,100 imperial quarto pages, containing nearly 6,000 illustrations. In paper, presswork and binding it is a beautiful specimen of modern bookmaking, and we are told that the cost of compiling, printing and distributing it will be about \$50,000, which is certainly a remarkable illustration of the immense cost of carrying on such a business as that of this firm. Of course it would be quite impracticable to even begin to mention the tools and fittings which are described and carefully illustrated, but there is little that the title covers that is not included in the pages of the catalogue. Each illustration is designated by a figure number, and the numbers begin where they left off in the catalogue of 1884; therefore, they run from fig. 3,000 up to 8,572. The descriptions give not only brief mechanical accounts of the construction of much of the apparatus illustrated, but weights, capacities and prices. The volume is prefaced by six very handsome engravings from photographs of the exteriors and interiors of the shops of the Pond Machine Tool Company, at Plainfield, N. J.; the Ashcroft Manufacturing Company, of Bridgeport, Conn.; the Consolidated Safety Valve Company; F. H. Reed & Co., Worcester, Mass., and the Shaw Electric Crane Company.

*Cast Iron Pipe and Heavy Castings.*—The Addyston Pipe & Steel Co., Cincinnati, O., issues a 10-page 7×9½ catalogue, giving the thickness and weights of all sizes of cast pipe, crosses, tees, elbows, bends, branches, etc., from 2 to 60 in. in diameter, for gas and water service and especially for culverts. Considerable space is given the advantages of cast-iron pipe for culverts, and to testimonials from railroads who are using iron culvert pipe. The company announces also its capacity to manufacture special machinery.

#### American Society of Mechanical Engineers.

The fourth session of the annual meeting of the Society was held at the Society house Wednesday forenoon, Dec. 6. Mr. R. C. Carpenter's paper on Constants for Correcting Indicator Springs was presented. This paper is a report of investigations by Mr. Carpenter and his associates to determine the average percentage difference in the readings of indicators when tested hot and cold. The paper provoked little discussion. It is a good illustration of the class of original work that is carried on at Cornell University and other technical institutions. The results are shown by diagrams on co-ordinate paper and in tables.

The next paper, by Mr. W. S. Aldrich, on The Use of the Indicator in Dynamometric Testing; and a paper by Prof. D. S. Jacobus on A Comparison of Mean Effective Pressures of Simultaneous Cards Taken by Different Indicators, were of special interest to engine designers and builders and valuable to have on record for future reference.

We give elsewhere a brief extract of Mr. R. C. Carpenter's paper on A New Form of Prony Brake.

Thursday forenoon the fifth session was held and some very interesting papers presented. The papers in this session were more practical and had less theoretical and mathematical investigation. Mr. H. L. Gault's Recent Progress in the Manufacture of Steel Castings provoked considerable discussion. We give an abstract of the paper and discussion in this issue. Mr. Wm. A. Pike's paper on Steam Piping and the Efficiency of Steam Plants brought out some discussion, the point of which was that the tendency is to return to the old method of cast pipes, with thicker shell and heavier flange.

In the next paper Mr. Charles H. Manning described briefly A Method of Manufacture of Large Steam Pipes which he employed 11 years ago for several thousand feet of 20 in. pipe, with very satisfactory results. The pipe was made of mild steel ¼-in. thick, double riveted, and with die forged flanges ⅝ and ½ in. thick. The pipe was riveted with an Allen pneumatic riveter having 70-in. reach of arms which limited the length of sections. The longitudinal seams were placed quartering 45 deg. from top of pipe, with the laps pointing up so as to be readily accessible for caulking. The quarter turns were made of two ⅝-in. sheets curved on a cast-iron former, and having a row of rivets along the back and another row along the throat. The tees were made of three sheets, shaped over similar formers, and the rivets were all on the sides. A serious difficulty had been previously experienced in keeping the roundabout-joints tight. Leaks had been caused by condensed water retained by these seams, which caused unequal expansion, as the portions covered by them heated much slower than the unprotected or dry surfaces. This was remedied by making the sections conical, and bringing all the laps in one direction, and then laying the pipe on a down grade with the smaller ends the

lowest, so that the water ran out. The last course of the pipe was not coned, to avoid having two sizes of flanges. Mr. Manning has never known a riveted pipe to give out under water-hammer, and a hammer that would completely wreck a cast-iron pipe or split a welded pipe would only strain the longitudinal joints of a riveted pipe. Mr. Manning does not claim this method of making the pipe to be new, but offers these points as what he has learned in his experience.

James B. Stanwood read an interesting paper on Strength of Rim Joints in Fly-Band Wheels, and Mr. F. A. Scheffler presented his paper on Tests of a Boiler using grates with a small percentage of opening. In this paper Mr. Scheffler has given the results of some tests he made with certain boilers to ascertain the evaporation per pound of coal at their rated horse power.

When about to make the tests an investigation showed that the grate bars were constructed with such extremely small openings as to lead the writer to believe that they would prohibit them from being used. The grates in question had openings not more than ⅛ of an in., the spaces having been narrowed by wrapping the pattern in the mould. These grates had a total area for the passage of air of only 15 per cent., while the usual openings for grates burning the kind of coal used were between ⅜ and ½ in., giving an area of 35 to 45 per cent. The draft gage showed .46 in. of water, a fair draft considering the grate openings. Everything being in readiness at the time, to carry on the test the writer hesitatingly decided to make it, if for no other reason than to demonstrate what boilers could do with 15 per cent. openings in the grate. The stack was 6 ft. in diameter and 125 ft. high. The theoretical draft for an average outside temperature of 50 deg., and of gases inside 553 deg., would be .88 of water. The average draft shown by the gage approximated closely to the theoretical draft. No analysis of coal was made, but a fair average of the theoretical efficiency of the coal is 13½ lbs. of water from and at 212 deg. The result showed that with only 15 per cent. grate area and with an overload of 60 per cent. above the rated capacity and when burning 24.8 lbs. of coal per square foot of grate surface per hour, the efficiency obtained was 71 per cent. Assuming that the volume of air required for theoretical consumption per pound of fuel was 128.4 cu. ft., the total volume of air required per hour would be 165,636 cu. ft., at 62 deg. temperature. The volume of air which would pass through the area of the grates per second theoretically would be 458 cu. ft., which, multiplied by coefficient say of 90 per cent., due to the shape of the grates, would reduce the quantity to from 458 to 402 cu. ft. per second and 1,447,200 per hour, which is about 8½ times the amount actually required for the combustion of coal, and shows that the openings of the grate were sufficient to furnish the requisite amount of air even had the damper been partly closed. A summary of the test is given in full, and as Mr. Scheffler says at the beginning of his paper, this is one of Professor Sweet's cases which he entitles "The Unexpected which Always Happens."

The last session of the Society met Friday afternoon and the remaining papers of the programme were presented. Mr. Wm. A. Roger's paper on The Cumulative Errors of Graduated Scales, Mr. Wm. H. Francis' Modern Disinfectant Plant and Mr. W. S. Crane's subject of Crucible Furnace using Petroleum were short descriptions of apparatus or of phenomena attending the operation of machinery.

Mr. R. C. Carpenter's Experimental Determination of the Effects of Water in Steam on the Economy of the Steam Engine brought out considerable discussion. Mr. Carpenter was on hand to sustain his position. He explained that the engine employed was kept for experimental purposes and that it had many styles of valves. Why the results were such as the experiments gave he was unable to say.

He said that the reason exhaust steam was more dry than the steam was just before release, was on account of the expansion without doing any work. Mr. Barnes' affirmation that the results of his tests would be very different for compound engines, he does not agree with, and does not see how they can be different.

The topical questions were next taken up, beginning with 102. Some of these brought out some interesting facts, given by the members from their practical experience.

#### Topical questions:

103. Will there be any difference in the size of the chimneys required, when the boilers are the ordinary tubular type, or of some of the water-tube forms?

This query brought out considerable difference of opinion from members present and absent. Some opinions were that there was no formula to give. A paper contributed said that the size of the chimney must depend upon the distance that the gases have to travel before reaching the stack. One author drew attention to the fact that Mr. Kent had given a formula in the transactions. Some members expressed the opinion that it was best to make a large chimney and then to damper it down if found too large. One member gave an instance in his experience where a stack had been found insufficient for two boilers and he had connected four more to it with excellent results. Of course the stack could be built higher and compensate in a degree for the size of it.

104. What is the best form of cylinder lubricator for engines carrying 140 lbs. of steam pressure, or over?

Two communications were read; one named the sight-feed lubricator, where the oil goes through a glass and is carried to the cylinders direct, and the second named the locomotive lubricator of the Lackawanna Lubricating Company as being one of the best. This lubricator feeds the oil direct to the steam pipe and depends upon the steam for carrying the oil to the cylinders.

105. What are the maximum safe speeds for hoisting and traversing in an overhead traveling crane in a machine shop?

One member gave the followingspeeds: Longitudinal, 400; trolley, 200; hoisting, 50 ft. per minute.

106. Is there any advantage in using a circulating device for the water inside a boiler, particularly of the three-furnace Scotch form?

A letter had been contributed saying that there was an advantage because the water below the fire is cold and still, which causes straining and leaking by unequal expansion. One member present recommended an auxiliary boiler. Another gave his experience with the Craig circulating apparatus which induced currents from the bottom of the boiler. Another recommended that the water should be fed below the furnace.

108. Will a forced circulation of air under a floor near the ground prevent decay of the woodwork and floor timbers?

This question brought out considerable interesting discussion. It was generally agreed that ventilation prevented the decay of woodwork; that dry rot was caused by dampness, and some experience was given. Mr. Woodbury expressed his belief that ventilation would not stop dry rot if the growth had begun. He named a process by which wood was heated to about 300 deg.; that the moisture inside would drive out the resin to the surface and sterilize it against the microbes of dry rot; that this vulcanized wood had given excellent results in his experience; that the usual solutions which were forced into the fibers of wood did not prevent rot effectually, especially if subject to the action of water; that nearly all these solutions were made in water, and that therefore water would dissolve them out of the wood as it had dissolved them before they were forced into the wood. Another member attacked the practice of, and showed the danger of, casing timbers with wood for appearances, and gave an instance in which timbers so encased had rotted within a few years, so that they had to be removed. Another gave it as his experience that timbers encased with wood were subject to sweating, fermentation and rotting. Another gave as his practice the boring of a good size hole throughout the center of a timber, so as to have circulation; that he had employed unseasoned oak with such a hole bored through it and preserved timber for a long time. Another recommended a preparation of brimstone. The general sentiment was that the ventilation should be accomplished by a circulation of dry or hot air, for steam would be destructive.

109. Have you any facts to show that there is a molecular change in metals when their temperature is raised or lowered?

The general sentiment expressed was that there were changes in metals, and as evidences the treatment of steel straight-edges was mentioned, and the fact that they were now drawn to a straw color instead of laying them away for a long time to season. A manufacturer of springs gave his experience in tempering them; that the wire was tempered continuously, but that the springs after being made were tempered in an air bath, which gave very good results. The rolling of metal was also given as an illustration. Old boilers taken out and inspected furnishes an illustration of changes metal undergoes, and this was especially illustrated by the lower tubes of a tubular boiler, the tubes being so staggered that the two or three lower rows get all the radiated heat, which amounted to 50 per cent. of the heating power of coal, or gave to the lower tubes 100 per cent. more heat than those above received. This caused early failure. The tubes frequently had permanent set, which gave great strain on boiler heads. Six hundred degrees were given as enough to cause this permanent set, which is a molecular change.

110. Have you any data as to earthwork dams which would suggest the factor of safety with which they have been built?

This brought out the expression that a factor of safety alone as regards static loading did not insure an earthwork dam; that nearly all the accidents and failures of earthwork dams were due to faulty details. Many instances were cited, among them the Johnstown disaster.

111. What have you found is the best form of straightening machine?

This was a question of considerable importance to wire manufacturers and was discussed by one of them. He described a machine consisting of a number of dies so placed as to hold the wire in the shape of a spiral, and these were revolved as the wire was drawn through. The spirals approached a straight line at the end where the wire left the machine. A tapering spiral shaped tube like the horn of an antelope or eland was tried, the exit end being nearly straight, but it was not a success. For straightening square wire, rolls were substituted for dies, which were placed in such position as to make the rod travel a spiralic path, the divergence being less and less.

113. Has any one tried sand-blasting as a method to produce a surface on cast iron before nickel-plating?

Answer by one member, who disclosed that sand-blasting had been tried in their works and had been abandoned; but the value of this reply was diminished by a statement that there were two factions in the



factory, one of which wished it to succeed and the other did not.

114. Is there any better method than japanning to protect steel from corrosion?

A member who had tried brass covering and nickeling and copper plating upon rolls which worked in water, answered this question and gave as his experience that none of them had been nearly as effective as simple japanning, which he considered the best. Certainly for use in water he was in favor of japan.

116. Which is the best process to repair old files, sand blasting etching or recutting? Do any of them really pay?

This query brought out some very contradictory expressions, some members having many years' experience having decided that it was best to throw away old files and buy new ones, and others being of the opinion that it did pay to buy the best files and to have them recut. It is curious that there should be so much difference of opinion upon such a question, and it would seem a good one for manufacturers of files to take a hand in. The expression of some of the members was that the probable reason why the experience was so varied was that cheap files had been bought.

The remaining questions were taken up in their order and brought out a moderate amount of discussion, and the Society adjourned *sine die*. Just before the adjournment Mr. Jacobus presented an improved form of attachment for a planimeter which is to avoid the objection to the pin point. Every one knows that the present form of polar planimeter is faulty in that the first operator is likely to make a groove on an indicator card which is followed successively by different manipulators. Mr. Jacobus adopts a small disk of horn or glass with cross hairs marked or cut upon it.

A portrait of Francis Reuleaux, Professor at the University of Berlin, was unveiled.

#### Manchester Ship Canal.

The directors of the Manchester Ship Canal formally opened the canal on Dec. 7. The public opening will take place on New Year's Day. The history, legislation and construction of the canal, with a map, have been given in the columns of the *Railroad Gazette*, on pages 612 and 685 of 1892, and in many shorter items in 1893.

A very interesting feature of the canal is its system of locks. These raise the canal to the height of the ground and end at the docks in Manchester, so that the vessels will discharge their freights on something like the general level of the city. Ships may enter the canal at Eastham by one of three locks. The largest of these is 600 ft. long by 80 ft. wide, and will accommodate steamers of the size of the White Star liner *Tauro*, which is of nearly 10,000 tons burden. The next size is 350 ft. by 60, and the smallest is 150 by 30. The various dimensions, besides allowing of more than one ship passing at the same moment, are intended to save both time and water. The large locks at the other places are the same length as the one at Eastham, but they are slightly narrower, being 65 ft. in width.

The canal has been finished and working for some time from Eastham to Saltport, a distance of about ten miles. The moving of the lock gates and the opening and closing of the sluices of the locks are all done by hydraulic power produced by engines at the side of the canal. The opening or shutting of the gates or turning of the valves of the sluices is done by merely moving a small lever. The engines will also supply electric light, so that the locks are brightly illuminated.

Port Ellesmere is three miles from Eastham, where the London & North Western Railway connects with the canal. A large iron floating graving dock, constructed at Newcastle-on-Tyne, has been towed from that place to Eastham, and is now moored above Port Ellesmere, where a permanent station will be prepared for it. A coaling station and a timber wharf have been constructed here. At Saltport the Weaver River joins the Mersey, and this will be the port for the Cheshire salt trade.

At Partington, near Irlam, the canal is widened out so that the vessels can lie on either side. Branch railroad communication will be made to bring coal from either Lancashire or Yorkshire and hydraulic coal tips are being constructed.

One of the most difficult problems in connection with the undertaking is at Barton. The Bridgewater Canal here crossed the river Irwell. The Manchester Ship Canal Company has bought up the Bridgewater Canal, and as it is far too valuable a property to have destroyed, communication must be maintained and yet allow the traffic on the greater canal to pass through. This was accomplished in the following manner: A large iron tank, 234 ft. long and 25 ft. in width, 6 ft. deep, was made with lock gates in the ends. There are also similar lock gates on the Bridgewater Canal. When no ships are passing in the great canal below all these lock gates are open and the barges pass over. When a ship has to pass below the gates of the canal are closed, and like a swing bridge the tank is then turned. This leaves a passage on each side of the pier, with ample space for large ships to sail past. When there is no traffic below the tank is then swung back, the lock gates opened and the Bridgewater Canal communication resumed. The tank is of itself 700 tons weight, and with the water in it it is 1,450 tons. It revolves on 64 rollers, each 2 ft. 8 in. long, which move

upon a circular roller path. The first canal aqueduct and the first swing aqueduct having come into existence at this spot gives Barton an historical association with the engineering profession. There is also a swing bridge for the ordinary traffic over the canal at this place.

The docks at Manchester are finished and are filled as far as the Mode Wheel Locks with the water of the Irwell. The quays are completed, but cranes for taking on cargoes, as well as sheds and warehouses to receive them, have not yet been built. The canal at the docks has been widened out, giving 114 acres of water space. The object of this is to allow ample room for shipping to pass out and in, and at the same time to be able to utilize the banks on each side as quays. When every thing is completed there will be  $5\frac{1}{2}$  miles of quay and 152 acres of ground on which may be constructed railways and structures necessary for a large shipping port. The plans also include a large dock at Warrington, but as yet that has not been begun.

#### TECHNICAL.

##### Manufacturing and Business.

The Foster Engineering Co., of Newark, N. J., in addition to a large order for valves recently received from the Consolidated Car Heating Co., of Albany, N. Y., has just entered an order from the same house for 50 Foster pressure regulators.

The Youngstown Bridge Co., of Youngstown, O., is building a double track through plate girder bridge 82 ft. 8 in. in length for the Cleveland, Lorain & Northern road, with a capacity for 123½ ton engines. Among other work under way are Z bar columns for the seven story Jackson Building at Nashville, Tenn., and two plate girder draws for the Jacksonville, St. Augustine & Indian River road. Three bridges are also being built by this company for the N. A. & A. R. R.

About 200 hands are now employed at the Ingersoll-Sergeant Drill Co.'s new works at Odenweldtown, near Easton, Pa., which are just being put in operation. The drill department has been started up.

The American Signal Co., of Baltimore, has been chartered by George W. Smith, Richard O'Toole, George E. Patterson, W. M. Stewart and Harry M. Benzinger.

The Fulton Truck & Foundry Company, of Mansfield, O., has been chartered with a capital of \$80,000, to manufacture street railroad trucks, frogs, switches, etc., and to do a general foundry business. Charles J. Longdon, Jr., W. S. Cappeller and Reid Carpenter are incorporators.

The Phosphor-Bronze Smelting Company, Limited, has removed its offices to 2,200 Washington avenue, Philadelphia. The company greatly increased its facilities for the manufacture of phosphor-bronze ingots, castings, etc., by the erection of a new foundry and smelting works at that location.

The Stiles Bridge & Construction Co., of Kansas City Kan., was chartered this week by the following directors: Vincent H. Stiles and George E. Stiles, of Kansas City; A. E. English and S. F. English, of Olathe, and J. B. Ford, of Bonner Springs.

The Barnes Car Coupler Company, of East St. Louis, has been chartered by Adiel Sherwood, Joseph B. O'Connor and Charles Voyce.

The Berlin Iron Bridge Co. announces a wages reduction of 30 per cent.

The Wagner Palace Car Works, at East Buffalo, is busier now than it has been at any time since last spring. The chief work is on general repairs and overhauling. The present force numbers 1,000, all working on full time.

The Gilbert Car Works (Troy, N. Y.) have shut down indefinitely pending reorganization. The works have been run under the receivership, to complete orders in hand.

##### Iron and Steel.

The officers of the newly reorganized Diamond Steel Co., of Reading, Pa., are: President, Penrose W. Hawman; Secretary and Treasurer, Samuel Y. Riegner; General Manager, Walter Steel, formerly of Wm. Jessup's Son's Steel Works, England.

Operations were begun this week in the new steel plant of the National Tube works at McKeesport, Pa. This plant cost over \$500,000, and has a capacity of 600 tons of steel a week.

The South works of the Lackawanna Iron & Steel Co. resumed operations Dec. 9.

The stockholders of the Belleville Steel Co., which failed in May, 1893, with liabilities amounting to about \$750,000, have organized a new company called the Valley Steel Co., with a capital of \$450,000, which will purchase the Belleville Steel Co.'s plant. It will issue preferred stock for half the old company's indebtedness, the remainder to be extended.

Work was begun this week at the Bessemer Steel Works, at Troy, N. Y., and at the Breaker Island blast furnaces, a part of the Troy Steel & Iron Company's plant which suspended operations some time ago.

The Pennsylvania Steel Co. will shut down the plant at Steelton, Pa., except the bridge and construction departments, employing about 600 men, from Dec. 23 to Feb. 1. About 3,500 men will be thrown out of employment.

Mr. C. Stuart Patterson, the chairman of the meeting of creditors of the Pennsylvania Steel Co., held on Nov. 29, who was directed to appoint a committee of seven creditors to confer with the committee of shareholders to arrange a plan of reorganization, has named the following committee: Alfred Earnshaw, of Philadelphia; Charles M. Stewart, of Baltimore; Howland Davis, of New York and Boston; W. J. Rainey, of Cleveland, O.; W. C. Freeman, of Cornwall, Pa.; A. J. Cassatt, of Philadelphia, and C. N. Weygandt, of Philadelphia.

##### New Stations and Shops.

The Reading Traction Co., of Reading, Pa., has placed the order for a car house with the Berlin Iron Bridge Co. The side walls will be of brick, the roof of iron. The building will be 85 ft. x 180 ft. The width is divided into two parts of 42½ ft. each, a row of columns supporting trusses at the center.

The Great Northern of Canada will erect repair shops at Lachute, Quebec.

The Illinois Central is to build new division repair shops at Midway, a new town about five miles north of La Salle, Ill.

##### Car Lighting.

We are told that the Illinois Central Railroad Company has determined to put in an improved light on 200 suburban passenger cars at Chicago. The company has had considerable experience with the Pintsch light on through trains between Chicago and St. Louis and New Orleans, and has, as a result of that experience, adopted it for suburban cars. The Michigan Central and Grand Trunk roads are to extend the use of this system on their cars; and to that end a gas compressing plant is to be erected at Detroit, which will furnish sufficient gas for local demands.

Appropos of the rapid extension of the use of gas for car lighting, we are glad to note the following words from Gen. Horace Porter's address on Safety Devices, before The World's Railway Commerce Congress: "To avoid the danger of oil lamps many experiments were made for the purpose of devising a compressible gas which could be carried in tanks and readily supplied to burners in the car, and gas lighting has now been very successfully applied. In addition to its safety, its convenience and cleanliness make it a very desirable means of supplying light."

##### The Canadian "Soo" Canal.

It is hoped to have the lock on this canal completed by July next, two years before the United States canal is opened, which General Poe expects to have ready by the spring of 1896. The early opening of the Canadian canal is desirable, as any accident to our one lock would be disastrous to navigation. The Canadian lock will be 900 ft. x 60 ft., with 21 ft. of water on the miter sills. The total length of masonry will be 1,106 ft. There will be 75,000 cu. yds. of masonry in the work. The face stone came from Amherstburg, Ontario, and the backing from Manitoulin Island. The total length of the canal is 3,700 ft. Work was commenced in May, 1899, but the plans have been changed once or twice. As the Canadians have but 14 ft. in the Welland Canal and are not enlarging the St. Lawrence canals to any greater depth, the reason for building a lock at the Soo with 21 ft. on the miter sills is not apparent.

##### Electric Cranes in Freight Houses.

A design of an improved freight house, with what is termed the Felkel multiple electric traveling crane has been sent to us. It consists of a freight shed about 50 ft. wide, by any length, with a large overhead traveling crane spanning the full width of the building. The crane is 20 ft. span, and has five hoisting trolleys running on as many parallel tracks the full length of the crane. These trolleys are to lift cases and other packages and convey them across the building from the cars upon one side to the platform in the middle, or to wagons at the other side. The traveling crane is essentially the same as is employed in large machine and construction shops, except that several trolleys are placed upon the crane on tracks, whose centers are 4 ft. apart. The scheme also provides for box or freight cars with hatches in the roofs. The operation of the crane contemplates the use of electric power generated by a gas or steam plant, or taken from an electric railroad system. The most essential feature of the design is not given, viz., the cost of installation and operation of such a plant. Mr. F. Felkel, 155 St. Clair street, Cleveland, Ohio, is the designer, and will no doubt be glad to give other particulars.

##### THE SCRAP HEAP.

##### Notes.

The Street Railroad Company in Cleveland of which Mr. F. D. Robinson is President, has given premiums of \$100 each to all conductors who have worked a year without accident.

Senator McMillan has introduced in Congress a bill calculated to prevent strikers interfering with mail trains, but with a provision that prohibits railroads from taking advantage of the act by endeavoring to carry on passenger traffic by attaching such cars to regular mail trains.

It appears that Connecticut now has a law requiring that delayed passenger trains shall be bulletined at stations, but on trying to carry it out at New Britain the Railroad Commissioners found that nothing is said



as to whether the bulletin shall be put up before the train arrives or after it leaves!

The Pennsylvania Railroad's World's Fair exhibit has been given to the Columbian Museum at Chicago. The John Bull locomotive and train, however, which belong to the Smithsonian Institution, have returned to Washington, the engine having made the trip under steam during the past week. The Wagner Palace Car Company's train which was exhibited at the World's Fair has started for California, where it will be shown at the midwinter exposition.

The Southern Pacific has issued an order to keep tramps off the freight trains, but the reporters think that there will be bloodshed if the order is carried out as there are parties of 50 to 100 each who will try to ride free whenever they feel like it, as they have been doing for some time past. The order was issued partly on account of the complaints of the towns along the road, whose pauper funds were violently disturbed. The company found that it was transferring burdens from one town to another in many a way that might work much injustice.

On the Texas & Pacific at Duval last Sunday night a passenger train was stopped and all the passengers and the express car robbed. There was considerable shooting and the fireman was injured. At Tangipahoa, La., on the Illinois Central, Saturday evening, three men attacked a passenger train, but the conductor was on the alert and repulsed them. The conductor and a section master were shot and injured. On the same night a robber broke into an express car of the Lake Erie & Western, at Bloomington, Ill., but was repulsed by the messenger.

Eight hundred and fourteen time-tables were corrected for the December issue of the *Travelers' Official Guide*. This is more than 50 per cent. greater than the largest number ever previously received in any one month in the history of the publication. The character of the changes is exceptional, many trains having been taken off, and the runs of many others materially shortened, resulting in a great reduction of train service. No such extensive alteration in figures has been necessary since November, 1883, when the change from local time to standard time took effect. For the December *Guide* of that year 486 time-tables were corrected. The *Guide* now consists of 946 pages, is 1½ in. thick and weighs 2 lbs. 6 oz.

The Chicago & Alton car shops at Bloomington began running full time Dec. 4. It is reported that the number of men discharged on the New York Central since Dec. 1 is about 300. The reports indicate that many of these discharges are in departments which are always reduced at the approach of winter. The Central of New Jersey has reduced the time in its shops to four days a week. The Canadian Pacific has discharged 100 men from the Toronto shops. The Atchison, Topeka & Santa Fe has put the shops on the regular winter schedule of eight hours a day and the same schedule has been prescribed at the Reading shops of the Philadelphia & Reading. Superintendent Sheppard, of the Pennsylvania, denies the published report that the Altoona shops were to be run on full time. He says that company has done everything possible to mitigate the hard times at Altoona, bringing work from other points to be done there.

A dispatch from Columbia reports that the South Carolina Legislature has already passed a bill, which has been approved by Governor Tillman, at whose instigation it was introduced, providing for the forfeiture of charter of any railroad corporation created under laws of the state whenever such corporation shall refuse or neglect or omit to pay the taxes as assessed and levied upon the property of such corporations for state and county purposes. If taxes are not paid within 30 days after they become due the Attorney-General is instructed to proceed against offending corporations, have their franchises forfeited, wind up their business, sell their property and divide the assets among the stockholders and creditors. The real object of the bill is to attempt to prevent railroads, in hands of receivers appointed by the United States courts, appealing to those courts for protection against taxes recently levied by the state.

#### Rails for the Pennsylvania.

The Pennsylvania Railroad is reported to have closed a contract for steel rails for the coming year with the various mills in the rail association. The contract is for 43,000 tons, to be delivered during 1894. Of this amount, the Eastern mills secure 36,000 tons, at \$24 per ton and the Western mills, 7,000 tons at \$25 per ton. For the year 1893 62,500 tons were ordered. The contract price then was \$29 per ton to the Eastern mills, and \$30 to the Western mills. The present contract calls mainly for an 85-lb. rail, and the amount involved is a little over \$1,000,000.

In this connection attention may be called to the serious loss suffered by the Pennsylvania through the depreciation in the value of the stock of the Pennsylvania Steel Company, of which it was one of the chief promoters. The railroad company holds 4,309 shares, of a par value of \$100, of the steel company's stock, upon which it last year received dividends amounting to \$40,500. It also holds \$180,000 of the bonds of the Maryland Steel Company. Not long ago the stock of the Pennsylvania Steel Company stood as high as 240, but it has fallen to 20, the difference in value between those figures being nearly \$1,000,000 on the railroad company's holdings.

#### Some New York Ferry Troubles.

The petition of the residents of Bay Ridge and Staten Island to the Sinking Fund Commissioners of New York to have provisions inserted in the Staten Island and

Bay Ridge ferry franchise that the 10 cents fare be reduced to five cents received no encouragement. The Mayor and members of the Commission are reported as having expressed their feelings that the residents of Bay Ridge and Staten Island could not expect them to give up the city's revenues for the benefit of outside interests. Furthermore, that it would be unjust to make the ferry company reduce its fares and still make it pay a larger sum for its franchises and leases as is now proposed. If the fares were reduced the price of the franchise should be reduced, which would be a loss to the city. The Comptroller reported legal complications that affected the Staten Island and Bay Ridge ferry franchises, and he was authorized to readvertise the sale of the franchises.

#### The Norfolk Navy Yard Fire.

On Dec. 6 fire destroyed the steam engineering and general stores building in the Norfolk Navy Yard. The fire started on the second floor where waste was stored. The building covered a space of 75 x 250 ft. and was two stories high. The loss is estimated at \$250,000. The papers in the building were saved.

#### Taxes on Interstate Business.

A recent decision of the General Term of the Supreme Court of New York decides that taxes must be paid on all of a railroad's business regardless of its origin or destination. The opinion sustains the contention of the Attorney-General that railroads doing business in the state shall pay a tax upon all their business, including that which is interstate. The railroads have contended that the United States Constitution forbade any taxation of this business, and it appears that Comptroller Chapin has so far agreed with them that he has not compelled the railroads to pay the tax and has made rebates to such railroads as have paid it since early in 1892. The test case was against the Dunkirk, Allegheny Valley & Pittsburgh. It is understood that the railroads will now pay their back taxes under protest and will carry the case to the Court of Appeals, and if necessary to the United States Supreme Court.

#### The Electric Railroad in the Baltimore Tunnel.

Mr. W. H. Knight, Chief Engineer of the Thomson-Houston Electric Company, has been in Baltimore recently discussing with Baltimore & Ohio officials the arrangements for running trains through the Belt Line tunnel by electricity. The Baltimore & Ohio company is to build the power-house, which will at first be a temporary structure, to be improved and made permanent if the feasibility of transporting heavy trains by electricity is fully demonstrated. The Belt road, under the most favorable conditions, will not be completed and ready for use before Sept. 1, 1894. The power-house can be built in a few weeks, but it is not likely that the work of constructing it will begin before next spring.—*Baltimore Sun*.

#### The Populists' Railroad.

The much heralded North and South Railroad Convention met at Topeka, Kan., Dec. 5 and 6, but the attendance was small; the promised "financiers" failed to put in an appearance but "an Emporia man" said he could raise sufficient capital to construct the first 50 miles of the line, provided the necessary funds would be forthcoming to complete it.

The convention considered plans for "putting the scheme in motion," besides the main line from the British possessions to the Gulf, there are to be branches to Arkansas, Missouri, Iowa and Minnesota. A board of provisional directors will secure charters, push legislation, interest capital, make surveys, accumulate chattels and "build and operate parts of the road." The directors will be expected to arrange for the construction of 2,550 miles of road in the immediate future, to cost \$38,250,000. The entire cost, it is estimated, will be saved to shippers by reduced rates annually.

All this was done by grown men, not children, and they appointed a lot of Lieutenant Governors and others directors.

#### An Old Chicago Institution.

Frank Parmelee's Chicago Passenger and Baggage Transfer will, after Dec. 31, be known as the Parmelee Company. Mr. Parmelee has sold the plant to the new company, though he retains a stock interest. John N. Abbott, ex-Chairman of the Western States Passenger Association and formerly General Passenger Agent of the Erie, will be President and General Manager of the Parmelee Company. The establishment has been owned and operated by Frank Parmelee for 40 years. It has grown with the city, and now has a monopoly of all passenger and baggage transfers for the 23 terminal railroad lines. No rival company has ever been able to gain a foothold in Chicago.

#### CAR BUILDING.

The Haskell & Barker Car Co., which shut down last August, has resumed operations this week, employing about half the usual force.

The Missouri Car & Foundry Co., of St. Louis, has leased to the Philadelphia Construction Co. 100 coal cars now building for the Kansas City, Pittsburgh & Gulf.

The New York, Ontario & Western has let an order for 500 coal cars to the Michigan-Peninsular Car Co. The cars are to be delivered during February and March.

The Michigan-Peninsular Car Company has secured a contract to build 600 cars for the Chicago & Northwestern. The shops have been idle for some time, but they will be reopened at once and will employ 500 men for at least two months.

The Ensign Mfg. Co., at Huntington, W. Va., which has been closed for several months, or working only in part, resumed operations in full last Monday, giving employment to about 1,000 men. This concern has taken contracts for building freight cars and snow plows which will keep it in full operation for three months. The latest snow-plow orders are from the Western Maryland Railroad and the New York, Susquehanna & Western Railroad.

The Wagner Palace Car Co. will probably have every car in its service vestibuled by the opening of summer, all of the cars sent to the shop being so fitted. The continuous platform is being attached to a number which will be used on the Michigan Central. The company has finished the building of a car storage house on the west side of its shops. It is 800 ft. long and four tracks wide.—*Buffalo Express*.

#### BRIDGE BUILDING.

Bloomsburg, Pa.—The Pennsylvania now asks that the proposed river bridge at this place be made a combination railroad and wagon structure, thus enabling the company to run a branch into this place.

Cumberland, Md.—The Edge Moor Bridge Works, of Wilmington, Del., is now building a new iron span bridge for the Piedmont & Cumberland Railroad over the Chesapeake & Ohio Canal, just below the Cumberland dam. The erection of the new structure began last Saturday.

Eldon, P. E. I.—Tenders will be received by J. W. Morrison, Secretary of Public Works, Charlottetown, P. E. I., until Jan. 9, for building a new steel bridge across Martin's Creek, near Eldon.

Jersey Shore, Pa.—The Beech Creek will replace the present wooden bridge which crosses the tracks in the Third Ward by an iron structure. The material is on the ground.

Norristown, Pa.—The Montgomery Commissioners are considering the question of erecting new iron bridges over the Wissahickon, a short distance above Ambler, and over Swamp Creek, in Upper Hanover.

Ottawa, Ont.—A joint committee composed of members of Hull and Gatineau Point, Que., councils, recently waited on the Chief Engineer of Public Works Department, at Ottawa, in regard to the erection of an iron or steel bridge over Pond Creek. It was agreed that plans should be prepared and tenders called.

Perth Amboy, N. J.—The local papers report that a project has been started for the erection of a highway bridge across the Raritan River, connecting Perth Amboy and South Amboy, in Middlesex County. The County Board of Freeholders have appointed a committee of five to inquire into the feasibility of the project. It is thought that state legislation in support of the scheme will be necessary. An effort will be made to secure a Congressional appropriation for the purpose. The bridge would be over a mile long.

Peterborough, Ont.—The Town Engineer has been instructed to prepare plans for a new bridge to span the river a short distance from the old railroad bridge.

Port Stanley, Ont.—Tenders will be received by J. A. Bell, Engineer, County of Elgin, until Dec. 20, at St. Thomas, for building an iron or steel bridge over Kettle Creek, in the village of Port Stanley. This bridge was referred to on Dec. 1.

Richmond, Va.—The new iron bridge of the Richmond & Danville across the James River near Richmond, referred to last week, has been constructed by the Pencoyd Iron Works. This bridge replaces a wooden Howe truss and is 846 ft. long, with two spans of 115 ft. and and five of 124 ft. The bridge has been delivered and is now being erected by the railroad company.

St. Cloud, Minn.—The contract for the iron and steel superstructure of the St. Germain street bridge has been awarded to the Pennsylvania Steel Company.

Wheeling, W. Va.—The new bridge of the Wheeling & Belmont Bridge Co., from Wheeling Island to Bridgeport, O., over the "Back River," is almost completed. The main structure is done, and the sidewalks are being put up. The street railroad tracks, of which there are three, are to be put down this week. The Wrought Iron Bridge Co., of Canton, O., which has the contract, will finish its work in two or three weeks.

Yankton, S. D.—A party of engineers has been engaged in making soundings for the purpose of locating a bridge crossing of the Missouri. It is understood that they are in the employ of the Great Northern Railway Co.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Lowell, semi-annual, 3½ per cent., payable Jan. 1.

Connecticut River, semi-annual, 5 per cent., payable Jan. 1.

New York & Harlem, semi-annual, 4 per cent., payable Jan. 2.

Pennsylvania & Northwestern, semi-annual, 2 per cent., payable Jan. 10.

Rutland, semi-annual, 2 per cent., payable Jan. 1.

##### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Brooklyn Elevated, annual, Brooklyn, N. Y., Jan. 3.

Cleveland & Pittsburgh, annual, Cleveland, O., Jan. 3.

Columbus, Shawnee & Hocking, special, Columbus, O., Dec. 20. To consider the proposed consolidation with the Sandusky & Columbus Short Line.

Grand River Valley, special, Jackson, Mich., Jan. 10.

Kings County Elevated, annual, Brooklyn, N. Y., Jan. 10.

New York & New England, special, Boston, Mass., Dec. 27.

Rome, Watertown & Ogdensburg, annual, New York City, Dec. 28.

Sandusky & Columbus Short Line, special, Sandusky, O., Dec. 21. To consider the proposed consolidation with the Columbus, Shawnee & Hocking.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Traveling Passenger Agents' Association will hold its convention in New Orleans, La., Jan. 9.

The Western Railway Club meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The New York Railroad Club meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The Northwest Railroad Club meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The American Society of Civil Engineers meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The Canadian Society of Civil Engineers meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The Technical Society of the Pacific Coast meets at its rooms in the Academy of Sciences Building, 519 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The Tacoma Society of Civil Engineers and Architects meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The Association of Engineers of Virginia holds informal meetings the third Wednesday of each month,



from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Locomotive Boilers and Their Attachments was the subject of the discussion at the December meeting of the club held on Wednesday of this week.

#### PERSONAL.

—Mr. H. Rittenhouse, of Bluefield, W. Va., has been appointed Assistant Engineer of the Norfolk Division of the Norfolk & Western Railroad, with headquarters at Crewe, Va.

—Mr. Charles H. Bihler, formerly Division Engineer, has been appointed Principal Assistant Engineer of the Northern Pacific to succeed Mr. E. H. M. Henry, appointed Chief Engineer.

—Mr. John A. Yoder, Assistant Engineer of the Lake Shore & Michigan Southern, with headquarters at Dunkirk, N. Y., has resigned in order to go into business at Old Point Comfort, Va.

—Mr. Frank Trumbell, who has been appointed Receiver of the Union Pacific, Denver & Gulf, is a well-known Denver business man and the manager of the Citizens' Coal Company, of that city.

—Mr. Robert Law has been appointed General Superintendent of the Burlington & Northwestern in Iowa, to succeed the late Mr. John T. Gerry. His office will be in Burlington, Ia.

—Mr. B. B. Toye, Western Superintendent of the Great Northwest Telegraph Company, died in Toronto, Ont., Dec. 6. Mr. Toye had been in the telegraph business since 1848 and was the inventor of the Toye automatic repeater.

—Mr. Frank H. Dabney, of Louisiana, has been nominated by President Cleveland to be Consulting Engineer of the United States on the international boundary commission, provided for in the convention with Mexico, of March 1, 1889.

—Mr. Charles M. Pratt, General Passenger Agent of the Minneapolis & St. Louis, has been appointed joint agent for immigrant traffic by the Western Passenger Association. Mr. Pratt's office will be in New York, and he will take charge on Jan. 1, 1894.

—Judge Edwin N. Paxon, one of the Receivers of the Philadelphia & Reading, sailed for Europe this week. As he expects to be absent for some time, Judge Dallas, of the United States Court, has vested the two other Receivers, Messrs. Harris & Welch, with full powers.

—Mr. C. M. Lawler has been appointed General Manager of the Philadelphia, Reading & New England. Mr. Lawler came to this road a few weeks ago, being appointed General Superintendent. Previously he was with the Philadelphia & Reading as Superintendent.

—Mr. H. B. Du Barry, who has been Engineer of Property of the Pennsylvania Railroad, with office at Pittsburgh for the last five years, died in that city on Dec. 2, aged 60 years. Mr. Du Barry was a brother of the late Mr. John N. Du Barry, Vice-President of the Pennsylvania, who died in December a year ago.

—Mr. George R. Ott, Master Mechanic in charge of the Chicago Division of the Baltimore & Ohio, died at Garrett, Ind., Dec. 9, aged 45 years. Mr. Ott went from Baltimore to Garrett about five years ago. Before that he had been foreman of the pattern shops at Mt. Clare. He was in the service of the Baltimore & Ohio over 20 years.

—Mr. J. B. Phipps, Assistant General Freight and Passenger Agent of the Inter-oceanic Railroad in the City of Mexico has resigned, and the office has been abolished. Mr. Phipps has been engaged in Mexican railroad work for nearly 10 years on the Mexican Central, Mexican National and since 1891 with the Inter-oceanic.

—Mr. J. A. Horsey, who was Vice President of the Cleveland, Akron & Columbus road under the former management, has resigned as a director of the company, his resignation being due, it is reported, to dissatisfaction with the company's recent financial proposals. He represents the Dutch stockholders who formerly were in control.

—Mr. Thomas K. Scott, who has been acting General Manager of the Georgia Railroad for the past few months, has been appointed General Manager of the line to succeed Mr. John W. Green, who has resigned. Mr. Scott was formerly Division Superintendent of the Louisville & Nashville, in Alabama, but since last July has been Acting Manager of the Georgia road.

—Mr. Jackson Smith has been appointed Division Passenger Agent of the Louisville & Nashville at Cincinnati, to fill the vacancy caused by the resignation of

S. F. B. Morse, who became Eastern Passenger Agent of the "Big Four" at Buffalo. Mr. Smith has been for several years Southeastern Freight and Passenger Agent of the Louisville & Nashville at Knoxville.

—Mr. R. H. Vaughan has been appointed Assistant Traffic Manager of the Monterey & Mexican Gulf Railroad retaining his headquarters in New York City. Mr. Vaughan came to New York in 1891 as General Eastern Agent of this road, which had then been only recently opened. He was previously Assistant General Freight Agent of the Mexican National road at the City of Mexico.

—Mr. Henry Schlacks, who resigned from the service of the Illinois Central Railroad Company on Feb. 1, of the present year, has been appointed Superintendent of Motive Power of the Denver & Rio Grande Railroad. Mr. Schlacks entered the service of the Illinois Central Railroad while a boy, and worked his way up to the position of Superintendent of Machinery, which he held for 10 years previous to his resignation.

—Mr. R. Adams Davy has opened an office as consulting engineer at Ontario Chambers, Ottawa, Can., and will be prepared to make plans and submit estimates for railroad work, water works, etc., and will also act as an engineering agent for companies and contractors having business with the Canadian Government. Mr. Davy was recently Chief Engineer of the Temiscouata Railroad, in New Brunswick, now operated by the Canadian Pacific, being in charge of the construction of the line.

—Mr. H. E. Huntington was elected President of the Central Pacific last week to succeed the late Senator Stanford. Mr. Huntington is a nephew of Mr. C. P. Huntington and has resided in San Francisco for the last two years as Mr. Huntington's personal representative. His title has been First Assistant to the President of the Southern Pacific and he will probably continue in that office. Previous to going to California he was General Manager of the Eastern Division of the Newport News & Mississippi Valley Company and other of Mr. Huntington's properties in Kentucky.

—Mr. W. V. S. Thorne has been appointed Superintendent of the Eastern Railway of Minnesota, with headquarters at West Superior, Wis. Mr. Thorne was for a number of years Private Secretary to Allen Manvel when he was General Manager of the St. Paul, Minneapolis & Manitoba. Subsequently he was appointed Superintendent of the St. Cloud car shops of the company, now the Great Northern. He was later promoted to be Assistant Superintendent of the Breckenridge Division of the road, and resigned that position to accept service with the Eastern of Minnesota, which is a part of the Great Northern system.

#### ELECTIONS AND APPOINTMENTS.

*Chesapeake, Ohio & Southwestern.*—The offices of Assistant Superintendent and General Roadmaster have been abolished. R. Morgan, formerly Assistant Superintendent, has been appointed Superintendent, and will have charge of transportation, with office at Paducah, Ky. A. F. Sabin has been appointed Engineer Maintenance of Way, and will have immediate charge of roadway, bridges, and buildings. His office will be at Louisville, Ky.

*Cincinnati, Hamilton & Dayton.*—R. B. Floeter is the new Superintendent of the Dayton & Ironton branch, with office at Wellston, O.

*Eastern of Minnesota.*—W. V. S. Thorne has been appointed Superintendent, vice F. A. Merrill, resigned.

*East Tennessee, Virginia & Georgia.*—W. A. Henderson has been appointed General Counsel, with headquarters at Knoxville, Tenn., to succeed Hon. William M. Baxter, resigned. Mr. Baxter was stricken with paralysis nearly a year ago and since then has been ill.

*Illinois Central.*—W. S. King, who has been Division Superintendent of the Yazoo & Mississippi Valley road with headquarters at New Orleans, has been transferred to Vicksburg, Miss. O. M. Dunn, Superintendent of the Louisiana Division, has been given jurisdiction over the line of the Valley north of New Orleans, and the road will hereafter be operated in closer connection with the Illinois Central than heretofore.

*Lehigh & Hudson River.*—Following is a list of the officers elected at the annual meeting at Warwick, N. Y., on Dec. 6: Grinnell Burt, President and General Manager; J. S. Harris, Vice-President; D. B. Halstead, Secretary; John Sawyer, Treasurer, and J. H. Olhausen, General Superintendent. Directors: Grinnell Burt, J. S. Harris, E. D. Adams, Geo. F. Baker, E. B. Leisnring, Henry Graves, G. A. Hobart, Edward Lewis, John S. Martin, J. R. Maxwell, George W. Sanford, W. R. Potts and Charles Caldwell.

*Ohio Valley.*—The offices of Assistant Superintendent and General Roadmaster have been abolished. L. A. Washington, formerly General Roadmaster, has been appointed Superintendent, and will have immediate charge of matters pertaining to transportation, roadway, bridges, and buildings. His office will be at Henderson, Ky.

*St. Louis Southwestern.*—C. P. Rector has been appointed General Agent of the company with headquarters at Memphis, Tenn. He was formerly General Freight Agent of the Missouri, Kansas & Texas, at Parsons, Kan.

*St. Louis, Southwestern & Texas.*—W. H. Quigg, formerly Traveling Passenger Agent of the lines in Texas, has been made Assistant General Freight Agent of the lines in Texas, with headquarters in Fort Worth.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

*Atlantic & Lake Superior.*—The shareholders of the company will meet shortly in Montreal to consider the affairs of the company. The project involves the lease or purchase of the Baie des Chaleurs road, the Great Eastern, the Montreal & Sorel, the Ottawa Valley, the Pontiac & Pacific Junction and the Ontario Pacific. H. N. Armstrong, of Montreal, who is the chief director in several of these roads, is Manager of the new project.

*Baltimore & Lehigh.*—The Dallastown business men have employed S. M. Manifold to make a survey from Taylor's trestle, on the Baltimore & Lehigh, to Dallastown, Pa., for a proposed line to that town to be about a mile long.

*Butte, Anaconda & Pacific.*—This road is now opened for freight traffic its entire length, to the smelters at Anaconda, Mont., and it is thought that the line

will be opened for passenger traffic probably this week. The road has been built largely by Marcus Daly and others interested in the smelters at Anaconda, so as to give better freight facilities for those works with the railroads reaching Butte, the Union and the Northern Pacific and the Great Northern. Heretofore the only railroad connection with Anaconda has been by a branch of the Montana Union. It has been expected that the road, when completed, would be operated by one of the older companies, the Great Northern probably, but it seems that for the present at least the new line is to be operated as an independent road. It is about 25 miles long between Butte and Anaconda. M. Donohoe is the Traffic Manager.

*Central of New Jersey.*—The company is constructing a line from Franklin Junction near Wilkes Barre, Pa., to a new anthracite coal breaker called Buttonwood. The new track is to be about three miles long and will cross over the Lehigh Valley main tracks at grade near Franklin. This crossing will be protected by interlocking signals, slip switches, movable points, etc. The contract for the interlocking plant has been awarded to the Johnson Railroad Signal Co., of Rahway, N. J. The Allentown Rolling Mills, Allentown, Pa., are making the switches, frogs, etc.

*Chesapeake & Ohio.*—The Twenty-mile Creek extension of this road in West Virginia, which has been under way for more than a year, has been opened for use a part of the way. The road is to extend from the main line at the mouth of Twenty-mile Creek, to a point in the valley of the same stream about 12 miles distant. All this has been graded, and the rails are laid over about half the distance. The road is in part a private enterprise of William M. Green, General Manager of the C. & O. R. R. He and his associates, including J. W. Ellsworth, of Chicago, and a C. H. Morris, of Cleveland, O., own 25,000 acres of coal land in Clay and Nicholas counties, W. Va., which will be reached by this road. Besides this, they own an option on 15,000 acres more in the same locality. This land is underlaid with the New River and Kanawha coking coals, and will be developed at once. It is the expectation that shipments of coal may be made early in February.

*Chicago Elevated Rapid Transit.*—Articles of incorporation of the company have been filed in Illinois. The line of road proposed to be built is from a point near Kinzie and State streets, Evanston. The incorporators are Russell Whitman, Albert A. Powell and William O. Lindley.

*Chicago, St. Paul, Minneapolis & Omaha.*—Extensive terminal improvements are planned for Allouez Bay at the head of Lake Superior, especially in enlarging track and storage facilities.

*Duluth & Iron Range.*—The road is making surveys for a new line up the hill out of Lake Superior, where it now rises over 100 ft. to the mile for several miles.

*Ebensburg & Black Lick.*—The contractor, C. McFadden, of Philadelphia, has resumed work on this Pennsylvania branch in Indiana County, Pa. About 10 miles was graded in the summer before grading was stopped. The new contract is from Big Bend to the forks near the old Ritter furnace near Black Lick. It is the intention of the engineers of the company to have the grading of this road completed early in the spring, and the road ready for business by June.

*Edinboro & Erie.*—Work on this Erie County line in Pennsylvania will begin next spring, it is announced. The company will convert the lake at Edinboro into a pleasure resort. G. E. Ryckman, of Brocton, N. Y., is President of the company.

*Elkton & Southern.*—The railroad meeting at Elkton, Md., on Dec. 5, resulted in the appointment of a committee to secure a charter for a company which is to undertake the building of a railroad from a point on the Baltimore & Ohio near Elkton in the Eastern Peninsula of Maryland, south through Lambson's, perhaps as far as Easton, on Chesapeake Bay. The committee includes George Biddle, David P. Davis and Z. Porter Lusby, of the first district; George S. Woolley, Henry H. Brady and John J. Williams, of the second; and John S. Wirt, Dr. Howard Bratton and Manly Drennen, of the third district. The projectors hope to secure the consent of the state legislature to transfer to the new company \$50,000 of Cecil County funds which was appropriated to assist a railroad that was never completed.

*Greenville & North Lawrence.*—This company filed articles of incorporation with the Secretary of State at Columbus, O., last week. The company has a capital stock of \$10,000, and is to build a road from a point near Navarre, Stark county, to the Pittsburgh, Fort Wayne & Chicago Railroad at North Lawrence, a coal mining town, five miles east of Orrville. The incorporators are John M. Cook, James Carl Bigger, Frank H. Kerr, George P. McCracken and T. A. L. Thompson. The office of the company is at Steubenville, O.

*Hammond & Blue Island.*—Articles of incorporation of the company were filed in Illinois this week. It is proposed to build a road from Hammond, Ind., to Blue Island, Cook County, Ill. The incorporator and first directors are Silas H. Strawn, Ralph Martin Shaw, James T. Maher, Edward S. Whitney and James Miles, all of Chicago.

*Itasca Lumber Co.*—R. A. Sims, railroad contractor, has arrived at Ottawa after completing a contract for the Itasca Lumber Co., of Minneapolis, on which he was engaged during the summer. The contract consisted of the construction of a road from near Minneapolis to Bow String Lake, a distance of about 25 miles. The ultimate terminus of the road will be on the boundary line in the State of Minnesota, about 25 miles farther on. It forms a connection with the Duluth & Winnipeg, the terminus of which is now at Deer River. John F. Sims, brother of R. A. Sims, is President of the new railroad.

*Kansas City, Pittsburgh & Gulf.*—It is thought that trains will run through from Kansas City to Siloam Springs, Ark., a distance of 231 miles, on Dec. 15. The track is now about finished to that point, and the work remaining to be done will not delay the opening beyond that date. The present terminus of the road is at Sulphur Springs, Ark., and the extension is through Benton County, Ark., for about 25 miles to Siloam Springs. During the present year the company has added nearly 100 miles of road to its operated mileage in Kansas, Missouri and Arkansas. It is proposed to extend the line next year south of the present terminus toward Fort Smith, Ark., about 80 miles. Bernard Corrigan, of Kansas City, had the contract for all the new work.

*Kansas City, Shreveport & Gulf.*—F. B. Hubbell, Vice-President of the Texarkana & Shreveport, and



other officers of that company and the Kansas City, Pittsburgh & Gulf, which controls the former road, have, it is stated, decided to organize a new company under the above name to build a southern extension of the Texarkana & Shreveport. This line is now being slowly extended north of Texarkana toward Fort Smith, Ark. The extension south of Texarkana will be built first to Shreveport with the object of finally building to the Gulf of Mexico.

**Kingston, Napanee & Western.**—It is reported that the company will build a branch line of road from a point in the township of Loughborough to Lake Sydenham, Ont. A branch from Harrowsmith to Sydenham, has been recently completed.

**Lancaster, Cecil & Southern.**—The company has a party of nine surveyors, under William Howatt, surveying a line from Childs, on the Baltimore & Ohio, south to Elkton, Md., and there is said to be some chance that this road will be built in the spring. The line at present built extends from Childs, on the Baltimore & Ohio, to Providence Mill, a distance of 4½ miles. The road will be extended to Oxford, Pa., in the spring, in addition to the Southern extension.

**Little Kanawha Valley.**—There seem to be good reasons for believing that this enterprise will be rehabilitated within a few months and that it will be pushed to completion. Senator Johnson N. Camden, of West Virginia, has been interested and says that he will be in position before many weeks to give the matter his personal attention and devote his time to securing the money needed to carry on the work. The counties through which the line is to pass whose subscriptions to the stock have lapsed will be asked to renew them. The road was surveyed in 1884, and is to extend from Parkersburg, W. Va., to Burnsville, Braxton County. The surveys have all been preserved, and show that in the entire 154 miles of the road there are no heavy cuts or fills, and that but one short tunnel will be necessary. The road will develop the coal and timber interests along the Little Kanawha River, and is to connect with the Baltimore & Ohio, Ohio River, and Raverswood, Spencer & Glenville roads.

**Mexican (Vera Cruz).**—The company has made a beginning of the work of relaying the entire line with steel sleepers and 82-lb. steel rails, and is now laying sleepers and 12 miles of track to complete the renewals between Esperanza and Paso del Macho, a total distance of 64 miles. It will take seven years to complete this improvement over the whole line. It is also proposed to replace the present locomotives with more modern engines.

**Middle Georgia & Atlantic.**—The extension of this line into Covington, Ga., which was to have been completed in the first part of the present year, seems to be delayed from one cause and another and is still unfinished. It is hoped, however, to have the track laid into the town by Jan. 1, and the line will be into operation about that time. The work now being finished is the building of a 1,200 ft. trestle and the tracklaying on six miles from Starrville, the present terminus the grading having been done several years ago. With the line built into Covington the company will have in operation 44 miles of road through Newborn and Machen to Eatonton, Ga., the eastern terminus, as well as a leased line 22 miles long from Eatonton south to Milledgeville. Arthur Pew, of Macon, Ga., is Chief Engineer.

**Midland Terminal.**—The road has now been completed to the town of Midland, Col., the track having reached that town, eight miles south of Divide Station, where the junction with the Colorado Midland is made, on Dec. 11. The snow and cold weather has delayed the tracklaying on this section, which was graded early in the year, and if the present unfavorable weather continues it is unlikely that much more work will be done until spring. The total distance to the Cripple Creek mining district will be 22 miles.

**Missouri River & Chicago.**—A charter has been granted to this company in Missouri, with a capital stock of \$1,200,000. The road will be constructed from a point on the Missouri, Kansas & Eastern Railroad, in Callaway County, near St. Aubert thence in a north-westerly direction to Fulton and Columbia, thence north-easterly to the Wabash, near Centralia, and to Hannibal, about 120 miles. The stockholders are all residents of Kansas City. The survey has begun near Mokane, on the Missouri, Kansas & Texas.

**Moundsville & Benwood.**—A company has been chartered, and has secured the right of way for a passenger and freight railroad from Benwood, W. Va., to Moundsville, a distance of 12 miles, over the public roads. The road is to be operated by electricity, and will pass through the towns of Benwood, McMechen, Glendale, and Moundsville, connecting at Benwood with the present street railroad to Wheeling. The money to build the road has been subscribed, and work will commence in a few weeks.

**Nelson & Fort Sheppard.**—President D. C. Corbin arranged to have the first regular train run through to Nelson, B. C., on Dec. 10. During the winter only two trains a week will be run from Northport, Wash., where the new line connects with the Spokane Falls & Northern, in whose interest it has been built. The new line is 70 miles long, 10 miles of this distance being south of the international boundary line and the balance in British Columbia. The road has been substantially built and most of the work was done this year. The heaviest grades are on the northern end near Nelson. Starting from Northport the road runs up the Columbia River to Waneta, thence up Beaver Creek some distance and across to the head of Salmon River. After this the road crosses the summit and extends down the Cottonwood River. A few miles of road remains to be built next year to the terminus in the town of Nelson. The present terminus is on the hillside above the town, but in the spring the road will be built to what is called Five Mile Point and thence back into the town on an easy grade.

**North Arkansas.**—This company has filed articles of association in Arkansas. The road is to begin at the main line of the Iron Mountain in Clay County, and extend through Clay and Randolph counties to a point on Current River, a distance of 16 miles. The capital stock is \$125,000. The directors are G. B. Oliver and Z. T. Daniels, Corning, Ark.; D. W. Reynolds, Reynors, Ark.; and H. M. Hill and Franklin Duff, St. Louis.

**Nova Scotia Coast.**—The first meeting of this company was held at Yarmouth, N. S., last week, when the following were elected Directors: Arthur S. Chandler, J. H. Noblit, Wm. H. Ambler, Thomas Robertson. T. Robertson was elected President and Arthur S. Chandler, Vice-President and Treasurer. It was decided that the location of the road from Yarmouth to Tusket should be immediately commenced.

**Nova Scotia Southern.**—A deputation representing business men of the city of Halifax, N. S., and the counties of Queens and Lunenburg recently waited upon the provincial government to secure further aid for this proposed railroad, of which R. G. Hervey is President. The company proposes to build a road from New Germany on the Nova Scotia Central to Sand Point in Shelburne, for which a provincial subsidy of \$3,200 a mile is asked. It is also proposed to build a branch from Indian Gardens and to extend the line from New Germany to a point near Halifax in the future.

**Path Valley.**—One hundred men have been put to work on the tunnel to pierce the mountain four miles beyond New Germantown, Pa., the terminus of the Newport & Sherman's Valley road, which is interested in the new enterprise. The tunnel will pass through a section of the celebrated Round Top Knob. The mouth of the tunnel is not far distant from the Beat Ponds, a series of natural springs which are the headwaters of Sherman's Creek, that empties into the Susquehanna at Duncannon. Grading along the route of the new line is progressing rapidly. David Gring, of Newport, is President and General Manager.

**Pennsylvania.**—A short line to be known as the Bute's Run Branch of the Southwest Pennsylvania is being constructed, to reach the coal and coke properties in Fayette county.

**Philadelphia & Delaware County.**—This is the only new branch of the Pennsylvania on which construction has been continued throughout the summer and fall. The work is now being pushed between Fernwood, Philadelphia, and Newtown Square, and the grading will be finished this month. Tracklaying will then be begun and the road will probably be ready for operation before the contract time, July 1 next.

**Revelstoke & Arrow Lake.**—The contract for five additional miles on this road, a branch of the Canadian Pacific, has been let, and the grading and laying of rails will be continued without any suspension and some of the new work will be completed by the end of the year. This will take the completed portion of the line as far as The Wigwam, about 15 miles from Revelstoke, B. C., and will facilitate traffic with the country along the lower end of Arrow Lake through the winter. The work on this new five-mile contract will be mostly rock work.

**United Counties.**—This road has been extended from St. Angelo, Que., to Iberville, a distance of about eight miles. The road is now completed from St. Hyacinthe to Iberville, 30 miles. It will be extended later north to Sorel and south to Henryville, Clarenceville and Lacolle in the province of Quebec.

**Wheeling Bridge & Terminal.**—The cold weather of the past few weeks has seriously hindered the work on the extension of this line from Wheeling, to Benwood, W. Va. However, it is hoped that the part of the road within the city limits of Wheeling can be completed and ready for trains by January, the time called for in the ordinance granting the right of way. A force of 50 men, all who could be worked advantageously has been grading at 37th street, and this work will be completed to the city limits in a few days. The crossing of the Ohio River road was put in last Sunday at 35th street and the tracks on the trestle at 37th street will be completed in another week. The trestle in the Wheeling corporation is 1,200 ft. in length, and between the city limits and Benwood there is twice as much more. All of this is ready for the rails, and consignments of rails are to be received this week. All the work is being done by the company's forces, Otto Schroll, being the engineer in charge.

**Wheeling & Lake Erie.**—This company has begun in earnest the work of pushing the line from Burlington to Bellaire, O. The road now connects with the Wheeling Bridge & Terminal railroad at Burlington, and by that means it has access to Wheeling and Martin's Ferry, O., while, by the Cleveland, Lorain & Wheeling, whose Martin's Ferry branch was made a union line by the city ordinance, it has access to the larger shippers of Martin's Ferry. Its objective point now is Aetna, Bridgeport, and Bellaire, O., all points which furnish heavy freights. To reach these it must build a line along the Ohio River, along which the Cleveland, Lorain & Wheeling road already has a line outside the natural river bank line. Most of the eight miles from the present terminus to Bellaire it will be necessary to go out into the river. This work has been already begun at Burlington by Fitzmorris & Reardon, of Fremont, O., who will put in the piles from the terminal junction to the lower end of Martin's Ferry. The City Council of Martin's Ferry has granted the company the right to cross the streets necessary to build the road through that town.

#### GENERAL RAILROAD NEWS.

**Atchison, Topeka & Santa Fe.**—The annual report of the company for the fiscal year ended June 30 last was published last week in a volume of 128 pages. It shows these operations for the whole system of 9,344 miles this year and 9,338 miles a year ago:

Year ending June 30.	1893.	1892.	Inc. or Dec.
Gross earnings.....	\$50,733,706	\$17,347,226	I. \$33,386,480
Operating expenses.....	34,668,168	32,229,770	I. 2,438,398
Net earnings.....	\$16,065,538	\$5,117,456	I. \$10,948,082
Total net.....	\$15,026,275	\$14,590,480	I. \$435,795
Fixed charges.....	11,133,382	11,274,626	D. 140,244
Balance.....	\$3,892,893	\$3,315,854	I. \$577,039
Second mort. interest.....	2,139,250	1,992,160	I. 147,090
Surplus.....	\$1,753,637	\$1,323,694	I. \$429,943

Betterment outlays amounted to \$2,189,375. Equipment outlays were \$1,002,394, not including \$915,754 under the equipment trust. Less than 2 per cent. of the \$80,000,000 income bonds remain unconverted.

The deficit of the St. Louis & San Francisco was \$75,253, and of the Colorado Midland \$489,366, and of the Atlantic & Pacific \$1,227,415, or \$1,832,775, including interest on advances to the proprietary lines.

The traffic movement for the year 1893 compared as follows with the preceding fiscal year:

Atchison system .....	\$28,791,449	I.	\$1,282,713
St. Louis & San Francisco system....	6,663,156	I.	431,710
<hr/>			
Total system.....	\$35,454,605	I.	\$1,714,423

PASSENGER EARNINGS			
Atchison system.....	\$8,720,832	I.	\$1,033,993
St. Louis & San Francisco system ...	1,884,582	1.	68,151
Total system ...	\$10,605,414	I.	\$1,102,144

**Cape Fear & Yadkin Valley.**—The rather indefinite reports of the sale of this road which were published

last week seem to have had as their only foundation an announcement made by one of the officers of the company that some financial negotiation had been successfully carried out in London. The negotiation referred to seems to have been the sale of an issue of new second mortgage bonds in England.

The annual report for the year ending June 30 last, just issued, shows gross earnings of \$549,354, against \$550,552 the previous year, a decrease of \$1,197. The operating expenses were \$353,909, or 64.42 per cent., against \$353,961 the previous year. The net earnings were \$195,445, against \$196,591, a decrease of \$1,145. There was an increase of business by connection with the Norfolk & Western and the additional output of the granite and brownstone quarries along the line which about equalled the decrease in general business and the reduction in passenger travel.

**Chesapeake, Ohio & Southwestern.**—Suit was filed in the Circuit Court at Louisville, Ky., on Dec. 11 by the Attorney-General of Kentucky, to prevent the purchase of the above road by the Louisville & Nashville. The grounds alleged are that the purchase and absorption of a competing line is forbidden by the state constitution.

**Chicago & Eastern Illinois.**—A good deal has been said in the daily newspapers during the last week about the reported purchase of this road by the Cleveland, Cincinnati, Chicago & St. Louis. Some of the statements are quite conflicting as might be expected. Both President Porter, of this company, and President Ingalls have denied that any sale of the property has been made, or was likely to be carried out immediately; whether there are any negotiations on foot with such an end in view is less easy of determination. Both officers admit that the matter has been under discussion in the past and there appears to be good ground for saying that such a purchase is a subject of present negotiation between the directors of the two companies.

**Columbia & Greenville.**—Separate Receivers have been appointed for this road by the United States circuit courts in Virginia and South Carolina in the suits of Joseph Bryan and F. M. Colstan, trustees. This action is similar to that recently taken by the same courts in relation to the Charlotte, Columbia & Augusta. The Columbia & Greenville has heretofore been operated as a division of the Richmond & Danville, but on Dec. 8 the Receivers of that road, Messrs. Spencer, Huidekoper & Foster, transferred to themselves as independent receivers of the subsidiary company all of its property except the Spartanburg, Union & Columbia road. The Columbia & Greenville main line extends between the towns named in South Carolina and is 143 miles long.

**Denver & Rio Grande.**—A statement of the earnings of the railroad for the month of October, 1893, and the four months ending Oct. 31, has just been issued, showing a decrease in both gross and net earnings. The figures for the two periods are as follows:

<i>For October—</i>	1893.	1892.	Dec.
Gross earnings.....	\$668,428	\$815,561	\$147,132
Oper. expen.....	343,655	453,102	109,448
Net earnings.....	\$324,774	\$362,458	\$37,684
Charges & Taxes.....	204,198	231,605	27,406
Surplus.....	\$120,575	\$130,853	\$10,278
<i>From July 1 till Oct. 31—</i>			
Gross earnings.....	\$2,210,436	\$3,337,285	\$1,146,849
Oper. expen.....	1,373,890	1,891,918	518,059
Net earnings.....	\$836,546	\$1,465,336	\$628,790
Charges.....	897,753	895,470	\$7,717
Surplus.....	\$28,793	\$569,866	\$541,073

**Duluth & Winnipeg.**—On Dec. 6 the general offices of this company were merged with the Duluth, South Shore & Atlantic, W. H. Fisher, Vice-President and General Manager of the D. & W., resigning. Both roads are under the control of Canadian Pacific interests. It is stated that the above road will be continued on toward Winnipeg and into the Red River Valley wheat region next year and that the two lines will form a part of a new through route for the Canadian Pacific.

**Evansville & Terre Haute.**—The report for the year ending June 30 makes the following comparison of earnings for 1892:

	1893.	1892.	Inc. or Dec.
Gross income.....	\$1,332,324	\$1,325,646	I. \$6,678
Oper. expenses.....	658,964	576,420	I. 82,544
Net earnings.....	\$673,359	\$749,226	D. \$75,867
Fixed charges.....	334,287	272,562	I. 61,725
Total net.....	\$339,072	\$476,664	D. \$137,592
Dividends.....	300,000	180,000	I. 120,000
Surplus.....	\$59,072	296,664	D. \$237,592

For the first half of the year, July 1 to Dec. 31, business was gratifying, but for the last half, to July 1, 1893, the revenue from general business proved very disappointing. Large amounts of money were expended to put the property in condition to handle the heavy traffic that was looked for from World's Fair business. The company has purchased 4,000 acres of coal lands in Indiana at a cost of \$130,000. From this property there is every reason to believe the company will derive a lasting source of business and great profit.

**Houston, Central Arkansas & Northern.**—At a meeting of the stockholders of the St. Louis, Iron Mountain & Southern road, held at St. Louis, on Dec. 11, it was voted that the company purchase the above road, which was built in 1891, from McGehee, Ark., south to Alexandria, La., 190 miles and has been operated by the St. Louis, Iron Mountain & Southern since it was opened in 1892.

**Illinois Central.**—The report of traffic earnings for the four months ending Oct. 31, 1893, and 1892, makes the following comparisons:

	1893.	1892.	Inc.
Miles operated.....	2,888	2,888	
Gross earnings.....	\$8,537,752	\$6,181,517	\$2,356,235
Oper. expenses.....	5,381,908	4,976,837	405,071
Net earn.....	\$3,155,844	\$1,704,680	\$1,451,164

The gross receipts from traffic for the month of November, 1893, are estimated at \$1,830,594; the receipts for November, 1892, were \$1,709,131, being estimated increase in 1893 of \$121,463.

**Jacksonville, Louisville & St. Louis.**—The United States Circuit Court has granted the petition of Henry W. Putnam, a stockholder, for the appointment of a separate receiver for the above road, a part of the Jacksonville Southeastern line. The appointment, however, will not interfere with the amicable working of the transportation interests of the whole line.



**Jacksonville, St. Augustine & Indian River.**—About 1,400 men are at work on the extension to West Palm Beach, Fla. The track is being laid from Sebastian south, and also between Jupiter and West Palm Beach at the rate of about half a mile a day on each end. The line is now open to Sebastian, 20 miles south of Melbourne. The regular trains to that point began running on Dec. 11. The grading and bridging are progressing rapidly. Charles O. Haines is Chief Engineer of the extension.

**Jamesville & Washington.**—The company has abandoned the portion of its line between Cherry Station, six miles from Washington, N. C., and the junction with the Atlantic Coast Line in Jamesville, and is now taking up this part of the track. On the remaining portion of the line it is carrying on business as before, this part being 16 miles between Washington and Cherry Station.

**Kansas City, Wyandotte & Northwestern.**—The foreclosure sale of this road in the proceedings brought by the Central Trust Company, of New York, which was fixed for Dec. 15, has been postponed to Jan. 5. This change was made by Judge Caldwell, of the United States Circuit Court, at St. Louis, last week, on petition of various interests. The upset price at which the road is to be sold is fixed at \$650,000 instead of \$1,000,000, the sum named in the original decree.

**Minnesota & Wisconsin.**—David B. Dewey, of Chicago, has been appointed by Judge Bunn, of the United States Court in Wisconsin, Receiver for the Wisconsin Iron & Lumber Co., and for the Minnesota & Wisconsin Railroad, which extends from Emerald to a mine and furnace of the iron company at Spring Valley, Minn., 22 miles. Ex-Senator D. M. Sabin, of Minnesota, is at the head of both companies, which were organized in June, 1892.

**New York Central & Hudson River.**—The company reports gross earnings for November of \$3,807,430, a decrease of \$106,078 as compared with the same month of last year. The statement for the quarter ended Sept. 30 is as follows:

	1893.	1892.	Inc. or dec.
Gross earn.....	\$12,211,847	\$12,066,596	I. \$145,251
Oper. exp.....	8,288,089	8,398,521	D. 110,432
Net earn.....	\$3,943,758	\$3,668,075	I. \$275,683
Fixed charges.....	2,629,848	2,508,220	I. 121,628
Profit.....	\$1,313,910	\$1,159,855	I. \$154,055
Dividend.....	1,117,854	1,117,854	
Surplus.....	\$196,056	\$42,001	I. \$154,055

Operating expenses were 67.71 per cent. of gross earnings, against 69.60 per cent. last year and the profits were equal to 1.47 per cent. on the stock, against 1.30 per cent. for the corresponding quarter of 1892.

**New York, New Haven & Hartford.**—An Advisory Committee from the Board of Directors has been appointed, the Board being now so large that it is found difficult to secure the attendance of directors at special meetings, which have been called with increasing frequency of late. The following Advisory Committee was chosen: President Clark, Chairman *ex-officio*; Vice-President John M. Hall and Prof. George J. Brush, New Haven; Henry C. Robinson, Hartford; William D. Bishop, Bridgeport; J. Pierpont Morgan, George M. Miller and William Rockefeller, New York, and Charles Choate, Boston. President Clark announced that the earnings of the road have fallen off at the rate of over \$200,000 a month for several months. Despite this fact the directors decided to declare the usual 2½ per cent. quarterly dividend. President Clark said that the decreased earnings of the road had been due to the business depression, but unless the depression continues longer than is expected, the company would be able to pay its regular dividends and keep out of debt.

**New York, Pennsylvania & Ohio.**—The annual meeting was held in Cleveland, Dec. 9. The gross earnings for the year were \$7,379,349, an increase of \$168,632, due entirely to the passenger department; total net earnings, \$2,323,287, of which \$1,827,865 was paid as rental, leaving a balance of \$445,000 due from the lessee.

**Omaha & St. Louis.**—Holders of a large proportion of the first mortgage bonds of the railroad met at 45 Wall street, New York, last week, for the purpose of considering action to protect their interests in view of the default in the interest. The following committee was appointed to make an examination and report a plan of action to the bondholders: W. Emlen Roosevelt, Cornelius B. Gold, Francis Smith, James A. Silvey, Abraham Mills and William Alexander Smith.

**Omaha Bridge & Terminal Co.**—The company last week filed a \$5,000,000 mortgage at Omaha. The mortgage is upon the new bridge across the Missouri River, the terminal tracks in Omaha, the lands and other property of the bridge company, and the money will be used to complete the payments upon the company's property and purchase more terminal lands.

**Oregon Railway & Navigation Co.**—The stockholders at a called meeting in Boston this week appointed H. R. Reed, T. L. Livermore and J. S. Fay, Jr., a committee to represent them in conference with the other interests in the Union Pacific system: It was understood that the German bondholders of the company were ready to act with the stockholders.

**Philadelphia & Reading.**—The petition of Isaac L. Rice asking for the removal of the receivers was filed in the United States Circuit Court at Philadelphia on Dec. 12. Judge Dallas fixed next Tuesday, Dec. 19, as the day upon which the case will be heard. The petition covers 50 pages of printed matter, and consists mostly of a reiteration of Mr. Rice's charges against ex-President McLeod and the receivers in regard to the Boston & Maine and New York & New England stock purchases. It is claimed that \$3,700,000 of third preference bonds have been illegally issued, and the Court is asked to order the cancellation of the issue. Finally, the removal of the present receivers is petitioned for. The Crane Iron Co. has sold to the Philadelphia & Reading Railroad what is known as the Crane Branch Railroad, three miles long, running from Chapman's to near Fogelsville, Pa., for \$15,000. The line was built eight years ago and reaches a rich iron ore section. The road will be operated in connection with the Catasauqua & Fogelsville road.

**Savannah, Florida & Western.**—The company has executed a mortgage to the Central Trust Company of New York covering its entire property, to secure an issue of \$20,000,000 consolidated first mortgage five per cent 50 year bonds, dated April, 1893. These bonds will be used to consolidate the indebtedness of the company and to create a contingent fund.

**Tobique Valley.**—Hon. John Costigan and H. A. Connell are negotiating with the Canadian Pacific for

the purchase of this New Brunswick road, according to reports in the Canada papers.

**Union Pacific.**—E. Ellery Anderson, one of the Receivers of the company and a Government Director, is now in the West, and in an interview at Omaha, about the reorganization of the system, said: Should there be objection on the part of some of the interests, I anticipate that the Receivers would hold office until the government debt matures, the first of the mortgages falling due in 1895. In order to bring about a reorganization, it is essentially necessary that all interests be friendly and show a disposition to accept the best appraisal possible under all the circumstances. This does not only apply to stockholders, bondholders and all security holders, but to the government as well. Should any of the interests mentioned insist upon dollar for dollar, then the reorganization scheme might as well be abandoned. The German holders met last week in Berlin and appointed a committee to act for the best interests of all concerned. Other security holders will probably adopt this plan of appointing authorized representatives. All the bondholders recognize the government debt, and nothing will be done that does not contemplate a satisfactory adjustment of the claims of the United States in the system.

**Union Pacific, Denver & Gulf.**—Frank Trumbell, of Denver, was this week named as the Receiver of this road by the United States Court at Denver. This appointment is said to be satisfactory to the Union Pacific interests as well as to ex-Governor Evans and the minority stockholders who brought the suit for appointment of a receiver.

**Washington Southern.**—The receivership of the company was terminated on Dec. 1, in the Superior Court, at Seattle, Wash., by the discharge of C. M. Sheafe, the Receiver, and the transfer of the road to the management of the creditors and stockholders by amicable arrangement among them. The road is managed solely for the interest of creditors, secured and unsecured, for the purpose of liquidating obligations, the payment of which is extended for two years. It is to be in the hands of a board of five trustees, the control of which will be by the creditors.

**Western New York & Pennsylvania.**—The company ceased operating the narrow gauge branch, which traverses the valley of Knapp Creek, between Bradford and Eldred, Pa., 20 miles, on Dec. 6. The failure of the oil industry in this region and the consequent loss of traffic has necessitated this action. Over a year ago the branch of the Bradford, Bordell & Kinzua, through the same valley, was also abandoned.

#### TRAFFIC.

##### Traffic Notes.

Removal of the exhibits at Jackson Park has not progressed so rapidly as anticipated, and but one third of the goods have been removed. About fifty carloads a day are taken away, and at this rate it will take three months longer to remove all the exhibits, and the time when all the buildings are clear will extend into March.

Mr. C. A. Wheeler, of the Transportation Bureau of the Cleveland Chamber of Commerce, has a system by which he keeps a record of shipments of freight sent out from the city. Postal cards bearing certain numbers which show what firm makes the shipments are sent out by the firm with the invoice of each consignment. Blanks on these cards filled up by the consignee show the date of arrival at destination. The card finds its way to Mr. Wheeler, who copies the data into a book so kept that the service of the different roads can be compared.

Prior to the fall of 1889 no flour had been ground at Duluth. That season a mill of 1,500 barrels capacity was completed. In 1891 the output was 700,000 barrels, and in 1892 1,094,000 barrels. Early in 1893 five new mills were built, and during November last all ran nearly at their full capacity, turning out 330,360 barrels, or a daily average of 12,700 barrels. While this by no means equals Minneapolis it puts the head of Lake Superior second in the list of American flouring centers. The eight mills at Duluth and Superior City have a daily capacity of 17,400 barrels.

This growth has been so great that many of the fast freight lines have established experimental agencies at Duluth, which probably will be made permanent. So far the following agencies have been established: Red Line and Hoosac Tunnel Line, La Salle & Wolbin, Nickel Plate Line, Trader's Dispatch, Interstate Dispatch, Lackawanna Line, and the Lehigh & Wabash; F. M. Guthrie, Grand Trunk, H. Hurdon, Canadian Pacific Dispatch, E. A. Cordell, West Shore Fast Freight, G. D. W. Mandeville, Blue Line, J. F. McLaren. The Pennsylvania is expected to open an office soon.

The charges made by the Mexican consuls for the certification of invoices of small shipments of goods going to that country will be reduced Jan. 1, the schedule from that date being: For valuations of \$100 and under, \$1; valuations in excess of \$100 and not exceeding \$1,000, \$4; and each additional \$500 or fraction thereof, \$1 extra. As the charge for this service in the past has been \$4 per invoice, regardless of value of property, the effect of the change will be to remove the embargo which has heretofore existed on the forwarding of goods to Mexico in small lots.

##### Chicago Traffic Matters.

CHICAGO, Dec. 13, 1893.

The outlook for an early settlement of the transcontinental passenger rate troubles is now much more promising than at any time for the past six months. The action of the Southern Pacific in again admitting the Canadian Pacific via Portland and the Shasta route to San Francisco has removed one of the principal objections offered by the latter company to a restoration of rates. Negotiations are now well under way looking toward the early restoration of rates.

The freight rate situation on transcontinental business, however, is not promising. These rates are already dangerously near a non-paying basis, and there is no indication of any amelioration in the situation.

No further open reductions are announced in east-bound freight rates, but there is no doubt but that each line is "protecting" itself to the best of its ability. The reduced rates have been extended to western points on through eastbound business and have also been met from Indianapolis and Cincinnati. While such action would be deplorable, it is questionable whether the Erie can successfully carry out its apparent policy of forcing the maintenance of rates without at once cutting rates to a non-paying basis. There is no doubt that in adhering to the law in the matter of legal publication of reductions it is handicapped by having its rates largely discounted before they can become legally operative.

West of here freight rates are apparently being maintained in all directions except on transcontinental business.

The Western lines have voted that their agents shall accept nothing but cash or its equivalent for tickets.

The Chicago & Alton, in connection with the Iron Mountain, the Texas & Pacific and the Southern Pacific, has put on a new through daily tourist sleeping car service between Chicago and Los Angeles.

Reports from the committee representing the Western lines, which went to New York to perfect the details of the immigrant agreement, state that the new scheme has been successfully launched, with C. M. Pratt as Joint Agent. Mr. Pratt, prior to his appointment, has been general passenger agent of the Minneapolis & St. Louis. It is also reported that the immigrant agents at New York have agreed to work through the association and co-operate in carrying out its provisions. It is understood that the Committee made a contract to pay the New York agents 10 per cent. of the through rate from Chicago to destination, and the agents will probably pay a share to the steamship lines. The agreement of the roads provides that—

No commission or so-called terminal expense of any kind shall be paid to the trunk lines or any other connecting lines on their issue of immigrant or second class tickets sold from or via the ports of New York, Philadelphia, Baltimore or Boston. An equitable division of all immigrant traffic ticketed to points on or via these lines shall be made by a joint committee of the Association, consisting of the Chairman of the Western Passenger Association, the Secretary of the Trans-Missouri Committee and the Secretary of the Colorado-Utah Committee.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending Dec. 9 amounted to 62,266 tons, against 45,452 tons during the preceding week, an increase of 16,814 tons, and against 77,188 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Dec. 9.		W'k to Dec. 2.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	10,637	17.1	5,696	12.5
Wabash.....	3,694	5.0	2,557	5.6
Lake Shore & Michigan South.	9,656	15.5	9,651	21.2
Pitts., Ft. Wayne & Chicago.	7,556	12.1	6,177	13.6
Pitts., Cin., Chicago & St. Louis	9,365	15.1	7,310	16.1
Baltimore & Ohio.....	3,377	5.4	2,383	5.2
Chicago & Grand Trunk.....	5,716	9.2	3,893	8.6
New York, Chic. & St. Louis.....	3,786	6.1	2,720	6.0
Chicago & Erie.....	6,732	10.8	3,343	7.4
C., C., C. & St. Louis.....	2,327	3.7	1,733	3.8
Totals.....	62,266	100.0	45,452	100.0

Of the above shipments 3,408 tons were flour, 27,491 tons grain and millstuffs, 11,503 tons cured meats, 11,329 tons dressed beef, 1,094 tons butter, 2,406 tons hides and 2,453 tons lumber. The three Vanderbilt lines carried 38.7 per cent., the two Pennsylvania lines 27.2 per cent. The Lake lines carried 22,545 tons, against 47,031 tons during the preceding week, a decrease of 24,486 tons.

(Other Chicago traffic news will be found on page 902.)

##### Westbound Rail and Lake Traffic.

The movement of freight from New York to Western points by rail and lake for the season of navigation shows a decrease from 1892 of about 18 per cent. Two roads only show an increase. The tonnage for the season was as follows:

	1893.	1892.	Inc. or Dec.
N. Y. C. & H. R.....	46,263	61,610	D. 14,747
N. Y., L. E. & West.....	42,185	48,774	D. 6,589
Pennsylvania.....	10,557	14,401	D. 3,844
West Shore.....	10,274	13,252	D. 2,978
Del., Lack. & Western.....	7,711	5,936	I. 1,775
Lehigh Valley.....	13,481	12,035	I. 1,446
New York, Ont. & Western.....	.....	210	.....
Total tons.....	130,471	155,618	D. 25,147

##### Activity in Ocean Traffic.

Steamships are now in demand and vessels suitable for foreign trade never were so scarce at this and nearby ports as at the present time. In consequence of this scarcity, freights for the far East advanced a cent a case on Saturday for sailing craft carrying petroleum.

Steam tonnage offering has been very light. All kinds of steam craft have been attracted to Southern ports, where remunerative freights are being paid for cotton and phosphate rock to European ports. These high rates have, to a certain extent, checked grain exports from Philadelphia, New York and Baltimore. In consequence of the lack of steam competition, West India coal freights have advanced to the highest figures for years past. The schooner W. H. Schubert is now loading at this port a cargo of coal for Cardenas, for which she receives \$1.95 per ton freight, an advance over last year's ruling rates of over 35 cents. Coal shippers who made contracts some time ago for the delivery of cargoes of coal at Cuban ports in November and December have lost thousands of dollars by this unexpected scarcity of tonnage. European vessels loading on berth have been largely benefited by the lack of competing ocean tramp tonnage. Old wooden vessel property has become a drug on the market, and, not being able to compete with the modern metal vessel, they are being laid up or sold to foreigners.—Philadelphia Record.

##### Minnesota Grain Inspection.

The annual report of the Minnesota State Grain Inspection Department for the year ending Aug. 31 has just been given out. The total amount of grain inspected "on arrival" during the year was 186,345 carloads, or 123,107,050 bushels. Of these 115,279 carloads were inspected at Minneapolis, 65,741 at Duluth, 2,500 at St. Paul and 1,241 at St. Cloud. During the year there was inspected "out of store" a total of 55,356 carloads, in addition to 35,936,135 bushels at Duluth "out of store" into vessels. The receipts of the department were \$131,286, and the expenditures \$171,281, making a deficit of \$40,995. As there was at the beginning of the year a surplus of nearly \$85,000, the rate per car for inspection was reduced from 20 to 15 cents. This reduction, and the expenditure of \$25,277 for the ground at Duluth for the state elevator, accounts for the deficit. There is still a balance in the fund of \$43,755.

A law of 1893 provides that "the grain inspectors, in opening cars for inspection, shall note the condition of the cars and record the same and reseat such cars with state seals after inspection. Railroad companies must furnish police protection for cars containing grain, and prohibit all unauthorized persons from loitering about their yards. . . . The law has been in operation eight months with beneficial results. The country warehouse law of 1893 did not go into effect until Aug. 1.